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PROJECT 4 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB) is primarily caused by the fungal pathogen *Fusarium graminearum* in North America, including Canada and the US. The fungal pathogen produces various types of mycotoxins and trichothecenes [Deoxinevalenol (DON) and its acetylated forms 3-ADON and 15-ADON]. Previous studies indicated that the 15-ADON producing isolates were predominant in the *Fusarium graminearum* population in North America. However, several recent studies have shown a population shift, i.e., increase of 3-ADON isolates over 15-ADON isolates, in the pathogen population in Canada and the US, especially in the northern Great Plains. Most of these studies for the population shift were based on molecular techniques and little information is available regarding the causes of this population shift. Although some assumptions were proposed, none have been verified. In this proposal we will attempt to address the following questions: 1) Is the 3-ADON population more aggressive than the 15-ADON population in FHB severity and DON production; 2) Is there any competition between the two chemotypes for their survival under field conditions? 3) Does the Sumai 3 resistance play a role in the fungal population shift? 4) Does temperature play any role in the survival or aggressiveness of the 3-ADON and 15-ADON populations? and 5) Does fungicide application affect the fungal population shift? To answer these questions, we will conduct both greenhouse and field experiments with two wheat cultivars (Grandin, susceptible and Alsen, moderately resistant to FHB) and well-characterized 3-ADON and 15-ADON isolates of *F. graminearum*. The field experiment will be conducted at Fargo with a split plot experimental design and three replications. Three plots (10x10 feet each) of each cultivar will be inoculated individually with (A) mixture of ten 15-ADON isolates, (B) mixture of 10 3-ADON isolates, and (C) mixture of A+B isolates and sprayed or not sprayed with fungicide. FHB incidence and severity data as well as DON accumulation in grains will be collected from all treatments to determine the difference between the two fungal populations as individual and as mixture in disease development. One hundred isolates of *F. graminearum* will be recovered from each treatment and genotyped for their chemotypes (i.e., either 3- or 15-ADON isolates) by using the Tri-based PCR assays. Similar work will be conducted in the greenhouse, at a smaller scale but under a more controlled environment to determine the effect of temperature on the two chemotypes. The information obtained from these experiments will help us to understand if the host resistance gene and environmental conditions (temperature and fungicide) have any effect on the pathogen population shift and could have a significant impact on FHB management and host resistance deployment.