

PI: Cai, Xiwen

PI's E-mail: xiwen.cai@ndsu.edu

Project ID: FY07-CA-137

FY06 ARS Agreement #: 59-0790-3-078

Research Area: HGR

Duration of Award: 1 Year

Project Title: Enhancing Resistance to Fusarium Head Blight in Wheat Using Alien Species.

PROJECT 1 ABSTRACT

(1 Page Limit)

Host resistance has played a significant role in the management of many diseases in wheat, barley, and other crops. Significant progress, however, has not been achieved with Fusarium head blight (FHB) in wheat and barley because of the lack of effective sources of resistance to FHB. Cultivated wheats, including durum and bread wheat, are allopolyploid and have a large number of relatives. Previous studies indicate that relatives of wheat represent an invaluable gene pool for wheat improvement. A number of genes conferring desirable traits, such as disease and insect resistance and tolerance to adverse conditions, have been identified from alien species and transferred to wheat. We identified four partial wheat-*Th. ponticum* amphiploids with FHB resistance compatible to "Sumai 3" in our screening experiments. These four amphiploids were hybridized with the *Ph¹* line and then with the spring wheat cultivars and breeding lines to eliminate unwanted alien chromatin and to introgress alien resistance genes into adapted genotypes. We identified 85 plants resistant to FHB from the BC₁F₄ and BC₂F₃ families. One of them was identified as a homozygous wheat-*Th. ponticum* chromosome translocation line containing a small terminal *Th. ponticum* chromosomal fragment. This project will continue to characterize chromosome constitutions of the progeny derived from these resistant plants using C-banding and fluorescent genomic *in situ* hybridization (FGISH) and to select homozygous wheat-*Th. ponticum* chromosome translocation, substitution, and addition lines via analysis of meiotic chromosome pairing. The genetically stabilized lines will be evaluated for FHB resistance, DON level, and other agronomic traits in the greenhouse and field. Further chromosome manipulation, if necessary, will be carried out to eliminate unwanted *Th. ponticum* chromatin in the resistant lines and to develop elite germplasm. The ultimate goal of this project is to develop breeder-friendly germplasm lines with FHB resistance derived from the wheat-*Th. ponticum* amphiploids. The specific objectives of this project during this funding period are to:

- 1) **Characterize chromosome constitutions of BC₁F₅ and BC₂F₄ progeny derived from the resistant BC₁F₄ and BC₂F₃ individuals;**
- 2) **Select cytogenetically stabilized lines in the BC₁F₅ and BC₂F₄ generation and evaluate their reaction to FHB in the greenhouse and field;**
- 3) **Eliminate unwanted *Th. ponticum* chromatin, if necessary, from the homozygous resistance lines.**

We anticipate releasing 1-2 resistant germplasm lines to breeders by the end of this funding period. Meanwhile we will assist breeders in efficiently deployment of alien resistance genes in new cultivars. Pyramiding of alien resistance genes and the resistance genes currently existing in wheat could enhance resistance of wheat and make resistance of wheat to FHB more durable.