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Research Area: **HGR** **Duration of Award: 1 Year**

Project Title: Alien Chromosome Engineering and the Deployment of a Novel Source of Fusarium Head Blight Resistance in Wheat.

PROJECT 1 ABSTRACT

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The overall goal of the proposed project is to develop wheat-*Leymus* compensating recombinant lines with small alien segments that still retain the FHB resistance gene for deployment and gene pyramiding for FHB disease control.

Project objectives

1. Develop wheat-*Leymus* chromosome recombinant lines with FHB resistance
2. Determine the effect of T7AL·7Lr#1S FHB resistance on DON accumulation
3. Pre-breed novel T7AL·7Lr#1S FHB resistance into US adapted wheat to verify resistance

Fusarium head blight (FHB) resistance was identified in the alien species *Leymus racemosus* (syn. *Elymus giganteus*). *L. racemosus* (Lr) chromosomes were isolated as single chromosome additions to wheat. Recently, we have located a FHB resistance gene on chromosome 7Lr#1 and identified a Robertsonian compensating translocation (T7AL·7Lr#1S) involving wheat chromosome 7A long arm (7AL) and 7Lr#1 chromosome short arm with FHB resistance mapped in the distal region of the 7Lr#1 short arm. Our immediate objective is to shorten the alien segment by *ph1b* gene induced homoeologous recombination. Using the currently available molecular markers, we will select plants homozygous for *ph1b* and heterozygous for the translocation chromosome. In homozygous *ph1b* genotypes, the alien segments harboring genes for FHB resistance can recombine with homoeologous wheat segments and recombinants can be identified with molecular markers. Homozygous recombinant plants will be available for further characterization by C-banding, genomic *in situ* hybridization and FHB resistance evaluation in the next granting cycle. Simultaneously, we will pre-breed novel T7AL·7Lr#1S FHB resistance into US adapted wheat to validate the effect of the translocation in another genetic background and potentially make it available for FHB resistance breeding. The T7AL·7Lr#1S chromosome currently in Chinese Spring background will be backcrossed twice with hard winter wheat (Overley). Homozygous lines will be recovered in BC_2F_2 progenies and evaluated for FHB resistance. Finally, we will study the effect of T7AL·7Lr#1S with FHB resistance on DON accumulation. Seeds from inoculated T7AL·7Lr#1S, Chinese Spring, and check cultivars will be sent to the diagnostic lab in Minnesota to test the DON content.

Host-plant resistance is the most effective way to control the FHB disease. A potential hazard to FHB resistance breeding is that only a few sources, mainly Sumai 3 and its derivatives, are now widely used around the globe. Thus, additional sources of resistance are needed in order to broaden the genetic basis of FHB resistance. We believe that T7AL·7Lr#1S FHB resistance is novel; and the level of resistance is similar to Sumai 3. Since it is located on an alien segment, it will be inherited as a major gene and will be suitable for gene pyramiding. The proposed project is directly related to the Host Genetic Resource area and will increase the amount of genetic diversity available for wheat FHB resistance breeding.