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PROJECT 1 ABSTRACT
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The overall goal of the proposed project is to identify novel sources of resistance to FHB and use directed chromosome engineering to produce compensating wheat-alien translocation and recombinant lines with novel sources of resistance to FHB and DON accumulation, develop genetic markers for the targeted alien chromosome segment to facilitate prebreeding into elite hard winter wheat germplasm, and make it available for wheat improvement programs. Previously, we have identified genes *Fhb3* and *Fhb6* for providing type-2 resistance to FHB. *Fhb3* was transferred to wheat from the tetraploid species *Leymous racemosous* in the form of a compensating Robertsonian translocation T7AL·7Lr#1S. *Fhb6* was transferred to the wheat landrace 'Chinese Spring' from the hexaploid species *Elymus tsukushiensis* in the form of a T1AL·1AS-1E^{ts}#1S recombinant chromosome. Previously we have transferred *Fhb6* into the adapted winter wheat cultivars Everest, Lyman, and Overland with native resistance to FHB. Adding *Fhb6* to wheat cultivars with native resistance to FHB will improve the level of FHB resistance and reduce DON accumulation. This fall we will distribute these advanced germplasms to the breeding community.

The specific objective of this project is:
Objective 1: Together with Dr. Yanming Zhang from Harbin Normal University, China who is presently a visiting scientist at the Wheat Genetics Resource Center at Kansas State University we have identified a novel source of type-2 resistance to FHB derived from *Thinopyrum intermedium/trielytrigia,* HSD2-32. We will use *in situ* hybridization and genomic *in situ* hybridization analyses to determine the chromosomal constitution of this line. In addition, we will use molecular marker analyses to determine the genomic and homoeologous affinity of the introgressed alien chromosome/s. Once the homoeology and genomic affinity of the introgressed chromosomes have been determined we will used directed chromosome engineering to develop agronomically useful wheat-alien recombinant chromosomes and introgress them into hard winter wheat cultivars. These novel recombinant lines will be evaluated for their FHB resistance and DON accumulation under greenhouse and field conditions. We already have increased the FHB resistant introgression line HSD2-32 and will start the cytological and molecular characterization in the 2019/20 growing season.

The proposed research will produce winter wheat cultivars with superior levels of FHB and DON accumulation and small seed samples will be distributed upon request.