PI: Bikram Gill **PI's E-mail: bsg@ksu.edu**

Project ID: FY12-HW-009 **ARS Agreement #: New-5yr**

Research Category: **HWW-CP** **Duration of Award: 1 Year**

Project Title: New Sources of Resistance to FHB and DON.

PROJECT 1 ABSTRACT

(1 Page Limit)

The overall goal of the proposed project is to use chromosome engineering to develop wheat-alien compensating translocation and recombinant lines with new 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.

Project objectives

1. Further evaluation of *Fhb3* (T7AL·7Lr#1S) resistance in Jagger/Overley background in greenhouse and field plots for FHB incidence and DON.
2. Evaluate *Fhb3* recombinant chromosome lines for FHB resistance in the greenhouse and field tests.
3. Evaluate and transfer new source of resistance from DA1E^{ts}#1, 2n = 44, derived from *Elymus tsukushiense*.

A wheat-*Leymus* translocation line (T09) involving unknown wheat and *Leymus racemosus* (Lr) chromosomes conferring FHB resistance was identified as a genetically compensating translocation involving the long arm of wheat chromosome 7A and the short arm of *Leymus* chromosome 7Lr#1 (T7AL·7Lr#1S) in CS (Chinese Spring) background. T09 was consistently resistant to FHB in greenhouse point-inoculation experiments. The novel FHB resistance gene was designated *Fhb3* and resides in the distal region of the short arm of chromosome 7Lr#1. T09 was backcrossed twice to Overley and Jagger. A total of 192 progeny homozygous for T7AL·7Lr#1S were selected by molecular markers from 436 BC_1F_2 plants. Ten lines homozygous for T7AL·7Lr#1S, three in Overley, and seven in Jagger background were evaluated for FHB resistance in a field nursery in Manhattan by W. Bockus in 2009. Two lines, 08-193 and 08-189, in Jagger and 08-184 in Overley background flowered at about same time as Overley and gave FHB (% infected spikelets) ratings of 12.4%, 14.1%, and 16.8%, respectively compared to 34.1% for Overley. The ratings of other *Fhb3*-carrier lines varied from 19.5 to 34.6%. DON accumulation of lines 08-193, 08-189, and 08-184 ranged from 10.2 to 12.6% compared to 22.2% for Overley. Simultaneously, chromosome engineering was initiated to reduce genetic linkage drag associated with T7AL·7Lr#1S. Three PCR-based markers, BE586744-STS, BE404728-STS, and BE586111-STS, specific for 7Lr#1S were developed to expedite marker-assisted selection of recombinants. Upon analysis of 1,118 progeny, three wheat-*Leymus* recombinants, one proximal (#124) and two distal (#679 and #989), have been isolated in homozygous condition. These lines along with resistant and susceptible controls will be evaluated for FHB resistance by the single-point inoculation method in the greenhouses. A second source of FHB resistance was derived from the *E. tsukushiense* chromosome 1E^{ts}#1, and we have identified one distal (TWL·WS-1E^{ts}#1S) and one interstitial (TiWL·WS-1E^{ts}#1S-WS) recombinant.

Relevant Milestones for FY11: 1. Further evaluation of *Fhb3* Robertsonian translocation and recombinant lines after point inoculation in the greenhouse and under field conditions and evaluation of DON accululation. **2.** Evaluation of the distal and interstitial 1E^{ts}#1 recombinants after single-point inoculation in the greenhouse.