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

PROJECT 1 ABSTRACT

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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 wheats, and make germplasm available for wheat improvement programs.

Project objectives:

1. Further evaluation of *Fhb3* (T7AL·7Lr#1S) resistance 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 a 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 short arm of chromosome 7Lr#1. T09 was backcrossed twice to Overley and Jagger. Ten lines homozygous for T7AL·7Lr#1S, three in Overley and seven in Jagger backgrounds, 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. Simultaneously, chromosome engineering was initiated to reduce the 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. Three wheat-*Leymus* recombinants, one proximal (#124) and two distal (#679 and #989), have been isolated in homozygous condition, which allowed mapping of *Fhb3* to the proximal recombinant Rec124. Both T7AL·7Lr#1S and Rec124 are being transferred to a Fuller background and will be evaluated for their FHB resistance and DON accumulation under field conditions. 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. Both recombinants are highly resistant to FHB after point inoculation in the greenhouse and are being transferred to an Everest background. Once homozygous recombinants in the Everest background have been obtained, they will be evaluated for their FHB resistance and DON accumulation under field conditions.

Relevant Milestones for FY12: 1. Further evaluation of *Fhb3* Robertsonian translocation and recombinant lines after point inoculation in the greenhouse and under field conditions and evaluation of DON accumulation and transfer of *Fhb3* to a Fuller background. **2.** Transfer of the distal and interstitial 1E^{ts}#1 recombinants to an Everest background and evaluation of their FHB resistance and DON accumulation under field conditions.