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Project ID: FY08-GI-087 **FY07 ARS Agreement #: 59-0790-7-075**

Research Category: **HWW-CP/VDHR** **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 translocation T7AL·7Lr#1S FHB resistance on DON accumulation
3. Pre-breed novel T7AL·7Lr#1S FHB resistance into US-adapted wheat to verify resistance

Addressing objective 1, we selected sixty-one plants that were homozygous for *ph1b* and heterozygous for the translocation chromosome by screening 154 BC_1 plants from the cross T7AL·7Lr#1S/ *ph1b* using molecular markers. These plants were either backcrossed with Overley and Danby or selfed. We have developed a large recombinant population with 1,400 BC_2 seeds and more than 8,000 BC_1F_2 seeds. In homozygous *ph1b* genotypes, the alien 7Lr#1S arm conferring FHB resistance is expected to recombine with the homoeologous wheat arm 7AS, although at a very low frequency. In year 1 of the grant, the BC_2 populations (>1,000 plants) first will be analyzed with molecular markers to identify recombinant progeny. RFLP markers previously mapped to 7Lr#1S will be used to detect crossovers in different recombinants. Homozygous recombinant plants will be isolated for further characterization by C-banding, genomic *in situ* hybridization, and FHB resistance evaluation in the year 2 of the grant.

To address objectives 2 and 3, the T7AL·7Lr#1S chromosome currently in Chinese Spring background was backcrossed to Overley and Jagger. We screened 20 BC_1 plants from T7AL·7Lr#1S/Overley and 36 BC_1 plants from T7AL·7Lr#1S/Jagger and obtained 52 plants heterozygous for the translocation chromosome T7AL·7Lr#1S. This chromosome was preferentially transmitted from the male side. Homozygous lines will be recovered in BC_1F_2 progenies and evaluated for FHB resistance and its effect on DON accumulation in a field nursery planted fall 2008.

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. This research is needed to broaden the genetic base of FHB resistance for gene pyramiding for effective FHB disease and DON control. The T7AL·7Lr#1S FHB resistance is novel and the level of resistance is similar to Sumai 3. Usually alien transfers are associated with undesirable agronomic traits due to linkage drag. However, chromosome engineering protocols have been made more efficient and agronomically useful lines can be usually recovered using these improved protocols (Qi et al. 2007). The advantage of such engineered alien segments is their large phenotypic effect and simple inheritance thereby facilitating their rapid deployment in wheat breeding programs.