

PI: Xu, Steven S.**PI's E-mail: steven.xu@ars.usda.gov****Project ID: FY08-XU-045****FY07 ARS Agreement #: NA****Research Category: VDHR-SPR****Duration of Award: 1 Year****Project Title: Introgression of Scab Resistance from Emmer and Persian Wheat to Durum Wheat.****PROJECT 1 ABSTRACT**

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We previously identified 16 Persian wheat (*Triticum turgidum* L. subsp. *carthlicum*) and 21 cultivated emmer wheat (*T. dicoccum*) accessions with resistance or moderate resistance to FHB. We are currently transferring the resistance from some of the accessions into ND durum cultivars using the backcross method coupled with double haploid (DH) and single-seed descent (SSD). We have developed approximately 500 DH and 591 BC₁-derived lines from the crosses of five *T. carthlicum* (PI61102, PI94748, PI94749, PI283888, and PI352281) and four *T. dicoccum* (PI41025, CI14085, CI14086, and CI14135) accessions with the four durum cultivars (Lebsock, Ben, Mountrail, and Maier). The DH and BC₁F₁-derived lines are currently being evaluated for FHB resistance in greenhouse and field nurseries. In FY08, we will select 10 DH and BC₁F₅-derived lines with the highest level of FHB resistance for the second cycle of introgression. In addition, we will initiate the introgression of the resistance from an additional 10 *T. carthlicum* and *T. dicoccum* accessions with potential novel genes for a high level of FHB resistance in tetraploid level. In the proposed study, the selected DH and BC₁F₅-derived lines and the *T. carthlicum* and *T. dicoccum* accessions will be first crossed with the durum cultivars Maier and Divide. The F₁ hybrids will be backcrossed with their durum parents to produce BC₁ seeds. All the BC₁F₁ plants will be evaluated for Type II resistance in the greenhouse. The BC₁F₂ plants derived from the BC₁F₁ plants with low infection will be advanced to the BC₁F₅ through evaluation and selection. The resistance in the BC₁F₅-derived lines will be validated by evaluating the lines using a randomized complete block design (RCBD) with three replications in greenhouse and field nurseries in two locations (Prosper and Langdon, ND). The seeds harvested from the inoculated spikes from the BC₁F₅-derived lines in the greenhouse evaluation and from field nurseries will be tested for DON content. The BC₁F₅-derived lines with a high level of FHB resistance will be used for further introgression and also will be distributed to durum wheat breeders for use in durum wheat breeding. A second objective of this research will involve the pyramiding of three wild emmer (*T. dicoccoides*) derived FHB resistance QTLs on chromosome arms 3AS, 6BS, and 7AL into the durum variety Divide using marker-assisted selection. PCR-based markers suitable for MAS have been identified for all three QTLs. Lines possessing both the 3AS and the 6BS QTLs have been crossed with a LDN-DIC 7A recombinant line harboring the 7A QTL. The F₁ progeny will be crossed to Divide, and molecular markers will be used to identify progeny heterozygous for all three QTLs. A second backcross will be made to Divide and progeny homozygous for all three QTLs will be identified using molecular markers in the BC₂F₂ generation. Phenotypic testing for reaction to FHB will be done to determine the effects of the three *T. dicoccoides* derived resistance QTLs in the Divide background. The new germplasm will be made available to durum breeders for incorporation into their breeding programs, and it will serve as a base for the incorporation of FHB resistance derived from the cultivated emmer and Persian wheats to be combined with the wild emmer-derived resistance into a single germplasm.