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Project Title: Introgression of Scab Resistance from Emmer and Persion 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 BC_1-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). In FY08, we selected four DH lines (BP888-7, BP281-13, BP025-3, and MC085-1) and six BC_1F_4-derived lines (07F48, 07F217, 08F130, 08F275, 08F286, and 07F468) with the highest level of FHB resistance for the second cycle of introgression. In addition, we initiated the introgression of the resistance from an additional 19 *T. dicoccum* accessions with a high level of FHB resistance. In FY08, the selected DH and BC_1F_4-derived lines and *T. dicoccum* accessions have been crossed and backcrossed with the durum cultivars Alkabo, Grenora, Maier and Divide. In FY09, the BC_1F_2 plants derived from the backcrosses will be advanced to the BC_1F_5 through evaluation for Type II resistance and selection in the greenhouse. The resistance in the BC_1F_5-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 BC_1F_5-derived lines in the greenhouse evaluation and from field nurseries will be tested for DON content. The BC_1F_5-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 is to pyramid three wild emmer (*T. dicoccoides*) derived FHB resistance QTL on chromosome arms 3AS, 6BS, and 7AL into 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. In FY 08, the 3A-6B/LD7A-28 F_1 plants have been crossed to Divide and the selected BC_1F_1 plants have been backcrossed to Divide. In FY09, we will genotype the BC_2F_1 plants to identify individuals heterozygous for the three *T. dicoccoides* QTLs, self to BC_2F_2. The BC_2F_2 progeny homozygous for all three QTLs will be identified using molecular markers. Phenotypic testing for reaction to FHB will be done to determine the effects of the three *T. dicoccoides* derived resistance QTL 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.