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Research Area: VDUN

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Project Title: Accelerated Breeding for Scab Resistance in Soft Red Winter Wheat.

PROJECT 2 ABSTRACT

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The specific objectives of this project are to: 1) Incorporate, characterize, and combine scab resistance genes from newly-developed scab resistant and/or scab tolerant SRW wheat lines in development and deployment of commercially viable wheat cultivars via haplotype selection and breeding; 2) Accelerate release of scab resistant cultivars and/or germplasm using molecular marker assisted breeding in the characterization and selection for FHB resistance; 3) Implement MAS for traits of economic importance having reliable selectable markers to simultaneously incorporate resistance to FHB and other prevalent diseases into high yielding cultivars having good end-use quality.

We have developed adapted FHB resistant SRW wheat lines by deploying a combination of top-cross, doubled haploid, and backcross methods. We also have characterized FHB marker haplotypes of resistant lines and have identified breeding lines possessing QTL on 3BS and 5AS associated with type I, type II and type III resistance. DNA profiles of eight markers in the two QTL regions are being routinely used to evaluate FHB resistance in parental lines used in crossing and in newly developed lines in our breeding program. In the current project, marker assisted evaluation and selection for scab resistance will be applied in 279 lines, including 60 parental lines, 93 lines in VA State Test, 56 lines in FHB Advance Test, and 70 lines in FHB Preliminary Test. Molecular markers for resistance genes located on four wheat chromosomes, 3AS (2 SSR), 3BS (3 SSR and 2 STS), 5AS (3 SSR), and 6B (4 SSR) will be used to enhance breeding for higher levels of resistance. Also, the 14 markers will be used to characterize FHB resistance in 181 F₅ RILs derived from the cross VA00W-38/ Pion26R46 in pyramiding FHB resistance with good end-use quality and resistance to other prevalent diseases.

In the 2007-08 crop year, 56 elite lines in the Scab Advance test, 70 advanced lines in the Scab Preliminary test, and 122 lines in Scab Observation nurseries will be evaluated in yield performance trials at two locations. All lines in these nurseries also will be evaluated for scab resistance in replicated disease assessment tests at Blacksburg, VA. An additional 424 SRW wheat genotypes, including entries in the three Uniform Scab Nurseries, entries from Virginia's State Wheat Test, advanced lines from the conventional breeding program, and 181 VA00W-38/Pion26R46 F₅ RILs will be evaluated for scab resistance in disease assessment trials at Blacksburg, VA. In headrow tests, 2,000 topcross and backcross derived lines will be evaluated and selected based on agronomic traits and resistance to other prevalent diseases at Warsaw, VA prior to being evaluated for FHB resistance in replicated disease assessment tests the following year at Blacksburg, VA. A set of 250 FHB breeding populations (144 F₂, 45F₃, 23 F₄, 35 F₅, and 3 F₆) will be planted, evaluated and subsequently selected in 160 ft² blocks in an irrigated scab nursery at Mt. Holly, VA during the coming crop season. New crosses will be made and greenhouse experiments conducted to evaluate type II resistance in conjunction with MAS in over 400 RILs and advanced lines.