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

PROJECT 2 ABSTRACT

(1 Page Limit)

To accelerate development of high yielding, scab resistant SRW wheat lines, we have deployed a combination of top-cross, doubled haploid, backcross, and molecular-marker assisted breeding methods. An initial doubled haploid line, VA01W-476, expressed a high level of resistance in both greenhouse and field trials and has been used as a parent in many breeding programs in the Eastern United States. VA02W-713 a top-cross (Ning7840/Pioneer2691//Roane) derived elite FHB resistant SRW wheat line ranked 1st in grain yield (77 Bu/Ac) among 54 entries in Virginia's Advance Wheat Test over three locations in 2004. This line also performed well in Virginia's State Variety Trials at six locations and in a regional test over four states in 2005. VA02W-713 will be evaluated in the USDA Uniform Southern SRW Wheat Nursery in 2005-06. Wheat line VA04W-433, evaluated in the 2005 Southern Uniform Winter Wheat Scab Nursery, was identified as having two major FHB resistance QTLs at 3BS and 5AS.

The overall project goal is to accelerate development of adapted and commercially viable scab resistant small grain varieties by identifying, incorporating and pyramiding diverse types of resistance into elite genotypes. The specific objectives of this project are to: 1) Incorporate and combine scab resistance genes from the newly-developed and characterized scab resistant and/or scab tolerant SRW wheat lines into commercially viable SRW and specialty wheat varieties; 2) Apply molecular marker assisted selection to accelerate development of scab resistant wheat lines and cultivars and; 3) Continue breeding activities on barley scab resistance.

We also have characterized haplotypes of FHB resistant lines and have identified breeding lines possessing QTLs on 3BS and 5AS associated with type I, type II and type III resistance. Availability of adapted germplasm and adequate QTL-marker information will accelerate breeding activities in deploying newly-developed lines possessing two major resistance QTL on 3BS and 5AS and implement MAS to pyramid these two major QTL and other minor QTL for all components of FHB resistance in adapted backgrounds.

In the 2006 crop year, 60 elite lines in the Scab Advance test, 85 advanced lines in the Scab Preliminary test, and 300 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. Entries in Scab Advance and Preliminary Tests also will be characterized with SSR and STS markers at 8 known QTL associated with all components of FHB resistance. An additional 200 SRW wheat genotypes, including entries in the two Uniform Scab Nurseries, and entries from Virginia's State Wheat Test, will be evaluated for scab resistance in replicated disease assessment trials at Blacksburg, VA. In headrow tests, 2,000 topcross and backcross derived lines and 1,000 NILs derived from a genetic study 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 180 FHB breeding populations (87 F_2, 28 F_3, 47 F_4, 9 F_5, and 9 F_6) will be planted, evaluated and subsequently selected in 160 ft^2 blocks in an irrigated scab nursery at Mt. Holly, VA this fall.