PI: Griffey, Carl A.	**PI's E-mail: cgriffey@vt.edu**
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Project Title: Marker Assisted Selection for Improved FHB Resistance in Adapted SRW Wheat Backgrounds.

PROJECT 1 ABSTRACT
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Elite wheat lines, such as VA04W-433, evaluated in the 2005 Southern Uniform Winter Wheat Scab Nursery, have been identified as having two major FHB resistance QTLs at 3BS and 5AS. In spring 2005, 180 crosses were made using such adapted FHB resistant lines crossed with adapted lines possessing other QTL, such as 3A and 2B. MAS will be implemented for pyramiding these QTL into adapted backgrounds to obtain our ultimate objective of releasing highly resistant cultivars in the near future.

Objectives of the current proposal are to: 1) Accelerate evaluation, genetic characterization, release and efficient use of adapted germplasm recently developed at Virginia Tech via backcrossing of FHB resistance to initial infection, spread, and DON accumulation into different genetic backgrounds; 2) Validate molecular markers linked to eight known FHB resistance QTL; and 3) Identify and characterize ideal haplotypes of newly developed FHB resistant SRW wheat lines using verified SSR and STS markers to facilitate MAS in wheat breeding programs.

In the proposed study, the presence of one or more of the eight known QTL for FHB resistance will be characterized and their effects on three components of FHB resistance and phenotypic performance in newly developed FHB resistant SRW wheat lines will be determined in four experiments at two locations. The expected outcome is to provide breeders with a useful package including adapted resistant germplasm and/or varieties and ideal marker haplotypes for use in MAS.

A total of 145 newly developed FHB resistant SRW wheat lines will be used in the current study. These lines were developed via backcrossing FHB resistance from six exotic sources (W14, Futai 8944, Shaan85, Ning7840, Ning9016, and VR95B717) into seven adapted SRW wheat backgrounds (Sisson sib, Roane, Pion2684, McCormick, Renwood3260, Ernie, and OH552). Type I resistance, assessed as FHB incidence, of these lines will be evaluated using a spray-inoculation method in a mist-irrigated field experiment at one location. Type II (FHB severity) and type III (DON accumulation) resistance will be evaluated in both greenhouse and field experiments at one location using floret inoculation and spray-inoculation methods, respectively. Effects of different genetic backgrounds and genetic contributions by donor, recurrent and/or adapted parents on overall phenotype and agronomic performance versus FHB resistance also will be assessed in field experiments at two locations.

Around 100 SSR and 4 STS markers at 8 QTL regions (2B, 2D, 3A, 3BS, 3BSc, 4B, 5A, 6B) previously reported as having association with at least one component of FHB resistance will be used to characterize haplotypes of lines following linkage analysis. Desirable and ideal haplotypes will be identified for three components of FHB resistance. These haplotypes subsequently can be used in selection of FHB resistance QTLs in breeding programs. The advanced lines with desirable haplotypes will provide breeding programs with a source of unique and adapted FHB resistant parents and some of the lines may have potential for release as cultivars. In addition, new QTL may be identified via comparison of characterized haplotypes.