0203-GR-013 Selective Breeding for Scab Resistance in Soft Red Winter Wheat.

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PROJECT ABSTRACT
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The overall project goal is to accelerate development of adapted and commercially viable Fusarium Head Blight (FHB) resistant wheat varieties by identifying, incorporating and pyramiding diverse types of resistance into elite genotypes. The specific objectives of this project are: 1) identify and select FHB resistant wheat lines derived from crosses among adapted and non-adapted lines possessing diverse types of resistance; 2) transfer resistance into adapted varieties via backcrossing, doubled haploid techniques, and DNA marker assisted selection; and 3) pyramid diverse and complementary resistance genes into Soft Red Winter (SRW) wheat genotypes.

Type II FHB resistance will be verified in 60 wheat genotypes of diverse origin, initially identified through collaborative research efforts such as the USWBSI, and in 100 advanced wheat lines developed in our program. Type II resistance will be evaluated in greenhouse tests via single floret inoculation procedures. Resistant genotypes of putative diverse origin and possessing other desirable traits will be used as parents in the breeding program and evaluated for uniqueness of FHB resistance genes in our mapping project. Progeny from 78 backcrosses, comprised of resistant plants selected from sixteen BC_3F_1 populations in 2001, will be individually evaluated in greenhouse tests for Type II resistance, and resistant plants will be backcrossed to their respective adapted parents. Thus, FHB resistance will be transferred into adapted wheat lines and will provide breeding programs with adapted Type II resistant parents possessing resistance to other prevalent pathogens and superior combining ability.

In field tests, nearly 180 SRW wheat genotypes, representing commercial cultivars and elite germplasm from the states of VA, NC, KY and MD, and 74 lines included in two Uniform FHB Screening Nurseries will be evaluated for resistance in an inoculated field trial. Such tests have led to the identification and release of adapted FHB resistant cultivars such as Roane, Ernie and Freedom, and new resistant lines are identified each year. Fifty new wheat lines having Type II resistance will be evaluated at Blacksburg, VA in replicated disease-assessment tests and at Warsaw, VA in a non-replicated yield trials. Twelve FHB resistant wheat lines will be evaluated in replicated yield trials at three locations in Virginia and in regional Uniform FHB Nursery tests at seven locations.

About 3,000 F_5 and F_6 headrows will be evaluated for FHB resistance at Blacksburg, VA, and another 4,000 headrows will be evaluated for agronomic traits and resistance to other prevalent diseases at Warsaw, VA. A total of 400 doubled haploid lines will be evaluated in greenhouse or field tests for agronomic traits and resistance to FHB and/or other diseases. More than 200 populations (128 F_2, 19 BC_3F_2, 48 F_3 and 20 F_4), developed to incorporate and combine type II and other types of resistance into SRW wheat backgrounds, will be planted in 200 ft^2 blocks in an irrigated nursery at Warsaw, VA this fall. Selection in F_2, F_3 and F_4 generations will include mass selection of spikes from plants possessing desirable traits as well as FHB resistance. Single spikes selected in F_5 and later generations will be planted and evaluated in headrow tests at Warsaw, VA the first year to select pure lines of desirable agronomic type and resistance to diseases other than FHB. Selected lines will subsequently be evaluated for FHB resistance at Blacksburg in inoculated field and/or greenhouse tests. Resistant lines with acceptable agronomic traits will be advanced and tested in replicated yield trials prior to release.