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Project Title: Development of Scab Resistant Soft Red Winter Wheat Varieties.

PROJECT 1 ABSTRACT

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Development of high-yielding, well-adapted FHB resistant varieties is an essential component in reducing the damage and substantial economic losses due to FHB when susceptible varieties are grown in years that favor FHB infection. This research addresses the following research priorities of the USWBSI Action Plan: development and release of varieties with improved FHB resistance, introgression of FHB resistance into breeding germplasm, and development and mapping of markers for sources of FHB resistance. Each year we make at least 200 two-way and 200 three-way or four-way crosses involving one or more sources of FHB resistance. Many of the resistance sources we are now using are breeding lines from our program or other soft red winter wheat programs, and many crosses now involve more than one source of FHB resistance.

In addition to evaluating all University of Illinois breeding lines in the misted, inoculated FHB field nursery at Urbana, IL we will evaluate the FHB resistance of breeding lines in six cooperative nurseries and the Illinois Wheat Variety Trial. Approximately 4000 rows will be evaluated in the replicated FHB nursery. Grain spawn (corn kernels cultured with 6-10 FHB isolates) will be used to inoculate the nursery which will be mist-irrigated during flowering. Data will be collected on incidence, severity and percent FDK, FHB and ISK indexes will be calculated and samples will be sent for DON evaluation. Data and germplasm will be shared with other breeding programs within the region and across regions. Producers will not adopt FHB resistant breeding lines unless they are yield competitive; therefore, breeding lines will be evaluated for an array of traits at multiple locations. We are using molecular markers in several projects to attempt to enhance the efficiency of the breeding program and speed up the rate of development of FHB resistant varieties. In addition to marker assisted selection (MAS) on about 10 populations for enrichment for the 3BS *Fhb1* locus in the F_2 in biparental crosses, we are beginning to implement genomic selection for FHB resistance in our breeding program using high density SNP markers.

Breeding lines from the University of Illinois program have regularly been among the most resistant lines in the regional cooperative FHB resistance evaluation nurseries. There are currently at least fourteen University of Illinois breeding lines with FHB resistance in commercial production or in various stages of advanced or regional evaluation and seed increase.