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Project Title: Development of Scab Resistant Soft Red Winter Wheat Varieties and Scab Resistance QTL Mapping.

PROJECT 1 ABSTRACT

(1 Page Limit)

Development of high-yielding, well-adapted Fusarium head blight (FHB) resistant varieties is an essential component in reducing substantial economic losses due to FHB. 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 300 crosses involving one or more FHB resistance sources. 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 FHB resistance source. We will evaluate six regional nurseries and all University of Illinois breeding lines in the misted, inoculated FHB field nursery. Approximately 2800 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. Data will be collected on incidence, and severity. Grain samples will be harvested, and percentage of FDK will be determined by visual assessment compared to standards with known FDK. FHB and ISK indexes will be calculated. At least 1500 grain samples will be sent to the lab at the University of Minnesota for DON evaluation. Data and germplasm will be shared with other breeding programs across the region. Breeding lines from the University of Illinois program have regularly been among the most resistant lines in the northern soft wheat FHB nurseries. We will evaluate Illinois Variety Trial entries in the FHB nursery. Information will be communicated to producers through posting the data on the Variety Testing website and inclusion in the Illinois Variety Trial report booklet. We believe this activity is very important to achieve the # 1 Goal of the VDHR section of the USWBSI action plan to "increase acreage planted with varieties exhibiting improved FHB resistance". This can only happen if producers have FHB resistance data available on current varieties.

We have several three-way crosses involving three FHB resistant lines in which we are pyramiding genes for FHB resistance. We will select adapted breeding lines from these populations; however, the objective is slightly different in that the expected outcome is parent development rather than lines that have potential as varieties. We are using phenotypic selection to select FHB resistant lines from F_3 or F_4 bulk populations but may also use molecular markers to select in these populations for the 3BS locus *Fhb1*. We are using molecular markers in several other projects to enhance the efficiency of the breeding program and speed up the rate of development of FHB resistant varieties. We cooperate with Gina Brown-Guedira at the USDA Genotyping Center on several of these projects. We will continue a backcrossing program with IL00-8061 by an FHB resistance source (primarily introgressing the 3BS locus, *Fhb1*). We plan to use molecular markers for F_2 enrichment of several (8) populations. These populations all have Ning7840 in the parentage, and the populations will be enriched for the presence of the 3BS locus *Fhb1*. We determine which plants carry the FHB locus, remove plants not carrying the target marker alleles and harvest the remaining plants in bulk to advance the population. Breeding lines from the University of Illinois program have regularly been among the most resistant lines in several regional nurseries. There are currently at least five University of Illinois breeding lines with FHB resistance in commercial production or in various stages of regional evaluation and seed increase.