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ARS Agreement #: 59-0206-4-019

Research Category: VDHR-SPR

Duration of Award: 1 Year

Project Title: Breeding Fusarium Head Blight Resistant Spring Wheat.

PROJECT 1 ABSTRACT

(1 Page Limit)

The objectives of this research are to:

- 1) Develop Fusarium head blight resistant wheat germplasm and varieties adapted for commercial production in Minnesota and the surrounding region
- 2) Characterize the level of FHB resistance of all wheat varieties grown in the region
- 3) Use FHB markers to characterize potential parental lines and utilize MAS to increase frequency of FHB QTLs in advanced lines
- 4) Produce doubled haploids to speed development of FHB resistant varieties.

Objective 1) Crosses will be made between and among FHB resistance sources and regionally adapted germplasm. We plan to screen more than 3,000 breeding lines from our program, including about 2,000 F₆ lines, 600 preliminary yield trial lines, 150 advanced yield trial lines and varieties, and 100 other lines with very high levels of FHB resistance. We will also screen the Uniform Regional Scab Nursery in two field nurseries. Two misted, inoculated FHB field screening nurseries will be used to characterize levels of FHB resistance. Visual assessment of FHB symptoms in the field will be done approximately 20 days after anthesis. A sample of 100+ spikes per row will be harvested, and after careful cleaning of grain, the percentage of visually scabby grain will be estimated. DON content will be determined from a bulk of grain from all replications of the most advanced nurseries (~800 total DON samples per year). Superior germplasm will be released as improved varieties, resistant germplasm, or made available upon request.

Objective 2) Approximately 25 named varieties and 10-15 pre-release lines from regional public and private wheat breeding programs are tested each year for yield performance at 15 Minnesota locations. These varieties are also evaluated for FHB resistance in the two inoculated nurseries. The data of released varieties will be summarized over all years available (including when they were evaluated as pre-release lines or as part of a regional nursery) to determine their scab resistance rating that is published each year in the Minnesota Extension Service's Varietal Trials Results book and also published online at <http://www.maes.umn.edu/>.

Objective 3) We will use the umn10 marker for *Fhb1* and barc180 for the 5AS QTL for MAS. We plan to submit approximately 1,000 lines that are candidates for entry into preliminary yield trials to the USDA-ARS Genotyping Center in Fargo, ND each year to characterize them for *Fhb1*, the 5AS QTL, and 6-10 markers for other important genes. This will result in approximately 10,000 marker data points per year. In addition, we plan to use markers to select for the FHB QTL in segregating generations of selected populations. An additional 10,000 marker datapoints will be generated from the early generation selections.

Objective 4) Approximately 300 doubled haploids will be produced to speed development of FHB resistant varieties. Source materials will be derived from the U of MN, NDSU, and SDSU spring wheat breeding programs.