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Project Title: Development of Fusarium Head Blight Resistant Wheat for the Southeastern United States.

PROJECT 2 ABSTRACT

(1 Page Limit)

North Carolina experienced a full-fledged Fusarium head blight (FHB) epidemic during the 2002-03 season with numerous reports of FHB incidences of twenty percent or above throughout the Piedmont and Coastal Plain. The milling industry reported one-half of the North Carolina crop unfit for human consumption. A few new varieties with moderate levels of resistance are coming on-line, but almost all current varieties grown on the approximately 2 million acres in the region are susceptible to FHB. The focus of the research at N. C. State will be twofold: a) to develop cultivars adapted to North Carolina, the largest wheat-growing state in the region, and b) to facilitate development of cultivars adapted throughout the region by coordinating the 2006-07 Uniform Southern Soft Red Winter Wheat Fusarium Head Blight Nursery. Our approach is enrichment of targeted populations of three-way F_1 's, F_2 and F_3 bulks using marker assisted selection combined with extensive phenotypic evaluation in later generations when heritabilities are greater and more seed is available. Twenty F_2 and F_3 populations and 20 three-way F_1 populations will undergo marker assisted selection. Selection will concentrate on *Qfhs.ndsu-3BS* and *Qfhs.ifa-5A* but additional loci will be targeted if appropriate. Obviously not all populations segregating for FHB resistance can undergo enrichment. In total, approximately 500 bulk populations in the F_2 and F_3 generation will undergo generation advance. Approximately 28,000 $F_{3:4}$ and $F_{4:5}$ lines will undergo selection for plant height, maturity, powdery mildew, leaf rust, Stagonospora, BYDV and perhaps Hessian fly resistance. A mist-irrigated nursery inoculated with a spore suspension at heading will evaluate entries in our Preliminary, Advanced and Observation nurseries in addition to the Uniform Southern FHB nursery. The remaining space will accommodate selected $F_{3:4}$, $F_{4:5}$, and $F_{5:6}$ populations. A Uniform Soft Red Winter Wheat FHB Screening Nursery for the 2006-07 season will be coordinated from N.C. State University. All FHB researchers will be entitled to enter materials and/or evaluate the nursery. Data will be returned to N.C. State, summarized and distributed to interested parties in a timely fashion. This project will provide breeders with critical information in a comprehensive, rapid and efficient manner to aid release of FHB-resistant varieties for southeastern producers. An added benefit will be the free exchange of breeding lines between variety development programs. These proposed objectives are related to the USWBSI goal of breeding and release of FHB-resistant wheat varieties and germplasm that are adapted to FHB-threatened states and multi-location validation of FHB resistance through participation in the southern uniform FHB screening nursery. The N.C. State program will continue to deliver agronomically desirable advanced generation lines with enhanced FHB resistance. Some of these lines will be cultivar release quality.