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PROJECT 1 ABSTRACT

(1 Page Limit)

Fusarium graminearum Schwabe (teleomorph *Gibberella zeae* (Schwein.), (scab) is an increasingly important problem in the north-central region of the United States. Yield losses in Missouri are difficult to quantify but are thought to have exceeded $400 million dollars since 1990. Losses in 1990 and 1991 alone were estimated to have cost the wheat industry in excess of $250 million. The identification of different sources of resistance is critical to the continued improvement of Fusarium head blight resistance in winter wheat. We hypothesize that where genes are different and are combined with those locally discovered; we should be able to enhance scab resistance in resulting breeding lines by improving resistance per se, improving resistance under higher inoculum loads, or by enhancing the stability of resistance over broad geographical areas. Previous work in this area has successfully identified several new sources of resistance from broad geographical regions. Three objectives are proposed for 2006 that include: (1) introgression of verified unadapted winter wheat germplasm carrying putatively novel sources of resistance into widely adapted soft red winter wheat cultivars; (2) phenotypic analysis of doubled haploid populations that contain potentially novel FHB resistance alleles and (3) haplotyping, 150 germplasm lines shown to have verified, FHB resistance. We seek to combine resistance genes from these sources using 2-, 3- or 4-way crosses with those known US 'native' sources including the widely adapted lines Truman, Bess, and Roane. Populations developed are advanced by bulk breeding under heavy disease pressure for four to five generations at which time head selections are made. In collaboration with Dr Gina Brown-Guedira, seven, parents used in the production of doubled haploid populations representing geographically diverse sources of resistance to FHB will be haplotyped to identify diversity for known FHB markers. In 2006, one or more of those populations that contain FHB alleles differing from known resistance alleles will be preliminarily phenotyped in preparation for mapping studies in 2007. The germplasm program at Missouri has screened in excess of 7000 germplasm lines acquired from the National Small Grains collection. Many lines have been identified through greenhouse and field evaluation of types I and II resistances, and kernel quality, to have resistance levels comparable or better than the Missouri resistant soft red winter wheat variety Ernie. However, most of these lines are unadapted, being too tall, late and other disease susceptible to be of immediate use in competitive breeding programs. Most are land races and as such, the origin of the FHB alleles they contain cannot be compared to known alleles by pedigree methods alone. In addition to the potentially novel sources identified at Missouri, many sources have been introduced into the US through USWBSI/CIMMYT collaborative germplasm acquisition efforts. Although the scab resistance in many of these latter lines does not hold up under Missouri inoculation procedures, approximately one third of these lines have shown to have useful levels of scab resistance. Approximately 150 lines from both the germplasm screening effort and the CIMMYT introductions that exhibit verified, high levels of resistance, but for which the FHB resistance alleles are unknown, will be haplotyped to determine relationships, if any, with known sources of resistance.