

PI: Anne McKendry**PI's E-mail:** mckendrya@missouri.edu**Project ID:** 0506-MC-120**FY04 ARS Agreement #:** 59-0790-4-113**Research Area:** VDUN**Duration of Award:** 1 Year**Project Title:** Accelerating the Development of Scab Resistant Soft Red Winter Wheat.

PROJECT 2 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. In 2004 another widespread outbreak occurred in the northern half of the state that significantly reduced yields in susceptible varieties. The identification of different sources of resistance in adapted soft red winter wheat will accelerate the development of scab resistant varieties and provide more immediate relief to wheat growers in scab years. In August of 2003, the University of Missouri Agricultural Experiment Station announced the release of 'Truman' soft red wheat, which was released for its broad-based resistance to *Fusarium* head blight. In the fall of 2004, the University of Missouri will announce the release of 'Bess', an early maturing full sib of Truman will equally high levels of scab resistance. Like Truman, Bess is widely adapted across the Corn Belt States with excellent yield and test weight potential. In 2004, Bess was in the top yield group among 81 commercial entries tested in Missouri and as such will provide immediate benefit to those production areas requiring an early maturing variety. Five objectives are proposed for 2005 including: (1) the identification of scab resistance through greenhouse and field screening of all advanced breeding lines in the Missouri wheat breeding program; (2) verification of useful sources of scab resistance through evaluation of both the Northern and Southern Uniform Winter Wheat Scab Nurseries; (3) the incorporation of new sources of resistance, as they are confirmed, into elite Missouri soft red winter wheat breeding lines; (4) verification of QTL associated with scab resistance in Ernie; and (5) characterization of the genetics of scab resistance in Truman and Bess. The 2005 scab nursery will include 240 paired rows of lines moving from the 2004 preliminary yield testing (PYN) into advanced yield testing (AYT), 160 lines retained from 2004 PYN nurseries just for scab resistance, and 34 lines retained from AYT testing in 2004. Also included will be 442 F₂ through F₅ plots of 2- 3-, or 4-way scab crosses containing Chinese, European and other non-Missouri sources of resistance crossed with Missouri scab resistant lines. Genetic analysis of resistance will continue with validation of 4 QTL associated with resistance (located on chromosomes 2BL, 3BS, 4BL, and 5AS) identified in Ernie. A total of 250 F₇ or F₈ lines from 53 pedigrees containing Ernie, were harvested in 2004. As these lines approximate near isogenic lines for scab resistance, we propose to validate markers from Ernie in these lines. Lines will be screened in replicated experiments in the greenhouse in 2004, the field in 2005 and genotyped in the fall of 2005 for these 4 markers. Finally, phenotyping of advanced populations derived from the cross Truman x MO 94-317 will be conducted as genetic analysis of this source of resistance is commenced.