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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 alone have exceeded \$300 million dollars since 1990. Host resistance is considered the most practical and effective means of control, however, breeding has been hindered by a lack of effective resistance genes and by the complexity of the resistance in identified sources. The identification of different sources of resistance is critical to the continued improvement of *Fusarium* head blight resistance in winter wheat. In 2002, resistances identified in advanced breeding lines in 2001 were confirmed and additional lines having high levels of scab resistance were identified. To date, resistance has been confirmed in 69 lines representing 47 pedigrees, 35 of which differed from Ernie (a resistant winter wheat developed in Missouri) by descent, were shown to have intermediate to excellent levels of resistance. Greenhouse spread in 10 of these lines was equal to Sumai 3 (8%). Preliminary screening of 315 additional advanced lines identified 37 lines from 28 pedigrees that had a greenhouse type II rating less than 10% and were comparable to Sumai 3 and 65 additional lines from 32 unique pedigrees that had a greenhouse type II rating less than 20%. Field indices in 65 lines were less than 20% and 12 of these lines had a field score of less than 10%. These sources offer the opportunity for the rapid release of functional levels of scab resistance to wheat growers because each is in a genetic background agronomically adapted to the soft red winter wheat region. Their combination with other exotic sources should accelerate the release of varieties that possess either more effective or more stable scab resistance. The objectives of this proposal are: (1) to identify useful sources of scab resistance through continued greenhouse and field screening of all advanced breeding lines in the Missouri wheat breeding program; (2) to identify and/or confirm further useful sources of scab resistance through field and greenhouse evaluation of the Northern and Southern Winter Wheat Scab Nurseries; (3) To continue to incorporate and pyramid new sources of resistance, as they are verified, into elite Missouri soft red winter wheat breeding lines; and (4) to characterize the genetics of resistance to scab in MO 980525. Germplasm will be screened in greenhouse and field environments to provide estimates of type II resistance, kernel quality, incidence, severity and the field index (incidence*severity) and agronomic value to winter wheat growers. Genetic diversity of over 100 newly identified lines carrying genes for scab resistance will be evaluated through the use of both AFLP and SSR markers including those defining SSRs linked to scab resistance genes in known sources of resistance. Conventional 6-generation means analyses will be used to study the resistance identified in MO 980525. This will complement molecular work and should facilitate effective exploitation of this source of resistance in breeding programs nationally.