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Project Title: Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties

PROJECT 1 ABSTRACT

(1 Page Limit)

Our wheat breeding project focuses on releasing scab resistant SRW wheat varieties adapted to KY and the southern corn-belt. In the KY crop rotation, wheat is always at risk for scab. Though recent years have been mostly scab free, in 2016 a late infection led to pockets where high DON levels were found in what appeared to be sound grain. In 2009 and 2014 Kentucky was decimated by scab: millers were unable to locate low DON grain and farmers were severely discounted. We know from extensive research that resistant varieties will reduce economic risk for farmers, millers and bakers. Consumers will benefit by having a safe food supply.

The proposed research comprises four areas of activity: (1) Crossing and selection - identifying superior agronomic parents to cross with FHB-resistant parents, selecting progeny based on phenotype as well as marker genotype, and confirming selections by repeated multi-location testing in scab nurseries and yield trials. Parents with native quantitative resistance along with those carrying exotic QTL are both used extensively in the breeding program. Both marker assisted selection and genomic selection complement phenotypic selection in identifying resistant lines to advance in testing. Inheritance studies that inform our breeding efforts are carried out by graduate students; (2) Screening - rigorous, repeated phenotyping of advanced breeding lines and existing cultivars is carried out in the inoculated, irrigated nursery at Lexington, while advanced breeding lines and wheat varieties are tested with and without fungicide in inoculated nurseries at two locations to provide farmers with information they need; (3) Collaboration - this includes screening collaborative nurseries to facilitate germplasm exchange, broaden the diversity of sources used in the breeding program, and provide excellent pre-release multi-location data for candidate varieties. We will participate in collaborative projects within our CP, involving cooperative phenotyping, doubled haploid lines and male sterile recurrent selection, and collaborative mapping studies with the southern CP; (4) Outreach - through collaboration with our grains extension specialist and extension plant pathologist, we communicate results from fungicide x variety trials (inoculated) to growers, extension agents, consultants and others in the wheat community. This data is ported directly to the Scab Smart website, presented at winter meetings and field days and is available from our breeding project website.

The relevance of this project to the U.S. Wheat and Barley Scab Initiative is that breeding scab resistant wheat varieties offers one of the best chances of success in our effort to minimize the threat of FHB to farmers, millers, bakers and consumers of wheat.