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Project Title: Improvement of Soft Winter Wheat for Fusarium Head Blight Resistance.

PROJECT 2 ABSTRACT

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Fusarium head blight (FHB) is a devastating disease of winter wheat in Indiana and adjacent regions. This immediate and severe threat to wheat production warrants accelerated breeding research including efficient selection technologies with the goal of combining enhanced resistance to FHB with superior agronomic performance, grain milling and baking qualities, and resistance to other important biotic and abiotic stresses.

Objectives of this research are:

- 1) develop soft winter wheat cultivars that have low-FHB incidence and type I and/or type II resistance; and that have resistance to other important diseases and are adapted in Indiana,
- 2) phenotype and genotype lines with specific combinations of FHB resistance QTL, determined by associated DNA marker genotyping, from multiple donor parent lines for which associated DNA markers have been reported, along with phenotyping in greenhouse and field tests, to verify preliminary results of augmentation of resistance.

To enhance our ability to select for consistently low FHB severity most seasons in the field we seed nurseries in disced corn residue and at several locations throughout Indiana, and we provide misted conditions to a large portion of our head row nurseries to enhance disease development. We also point inoculate in field and greenhouse nurseries to ensure disease development for selection. We conduct two consecutive cycles of crossing in the greenhouse per year, and we grow F₁ populations in late summer-early fall in the greenhouse so that we can seed F₂ nurseries in early November at Evansville, IN--gaining one generation each year, accelerating the inbreeding of populations for selection.

We will continue to pyramid FHB resistance QTL from a number of donor parent lines, phenotyping for resistance and genotyping with DNA markers associated with specific resistance QTL, increasing the effectiveness of resistance compared to partially resistant parent lines with one or another resistance QTL. We will develop closely related wheat lines, both by backcrossing into backgrounds that have specific resistance QTL, and resistant backgrounds having as yet unmapped resistance (like Truman), and by identifying progeny from single F₃ and F₄ plants that contrast for specific resistance QTL, and segregates that are susceptible, to determine augmentation between specific resistance QTL, and types of FHB resistance. We will also combine FHB resistance with resistance to other important diseases of wheat in Indiana, along with improved agronomic performance and soft wheat milling and baking qualities to produce wheat cultivars with effective levels of FHB resistance that have commercial value for production and utilization.