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Project Title: Genetics of, and Breeding for, Fusarium Head Blight Disease Resistance in Wheat

PROJECT 1 ABSTRACT

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Fusarium head blight (FHB) is the most devastating disease of wheat and barley in the United States mainly caused by the fungal pathogen *Fusarium graminearum* Schwabe [telemorph: *Gibberella zeae* Schw. (Petch)]. In United States, scab was reported in 1890s and there had been sporadic outbreaks of FHB epidemics since then. Several measures facilitated by rotation, tilling, and fungicide application are used to reduce initial inoculum, dispersal of the inoculum, or to restrict the spread of the infection in the spikes. However, these measures either do not provide enough control to disease or are expensive, reducing the total profits. Use of resistant cultivars is the most effective way to reduce the adverse effect of scab disease on yield and quality.

FHB resistant and moderately resistant varieties in combination with management practices can mitigate the adverse effect of FHB disease. The objective of this continuing project is the development of high yielding and FHB resistant varieties for growers in Indiana and producing FHB resistant lines that can be used in breeding as parent.

The PI's first five years of work in this position included 1) starting crosses between high yielding and FHB moderately resistant lines (based on available data) and 2) evaluating grain yields and FHB traits of existing Purdue-bred germplasm by using phenotyping and genome-wide DNA markers. This data helped characterize segregating FHB loci in the germplasm, which was published in Plant Disease Journal and will guide us to design new breeding crosses.

The objectives of this proposal are 1) continue crosses of high yielding and moderately FHB resistant lines to develop new genetic variation, advancing segregating progeny, and line development; 2) preliminary and advanced yield trials for agronomic trait assessment of developed lines; and 3) field-based screening elite nursery for FHB resistance. This research will result in developing high-yielding and FHB resistant varieties and advanced lines for germplasm exchange. The FHB resistant lines that will be developed by this project will be shared with other breeding programs to be used as parents in their crossing programs. The research data will be communicated in conferences and published in scientific journals (Gaire et al., 2020 & 2021). In addition, this research provides an opportunity for hands-on education and research skills of graduate and undergraduate students.