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Project Title: Development of scab resistant wheat varieties for Michigan and the Great Lakes Region

PROJECT 1 ABSTRACT
(1 Page Limit)

Michigan State University Wheat Breeding and Genetics aims to develop high yielding soft winter wheat varieties and germplasm with resistance to Fusarium Head Blight that are adapted to Michigan and the Great Lakes region. Disease promoting conditions are present annually placing the entire wheat value chain at risk. Through the proposed work, resistant varieties will be made available to wheat farmers in the Great Lakes region and the soft wheat milling industry will be supplied with a more consistent supply of high-quality grain. Developing and releasing FHB-resistant varieties will help support a critical part of the agricultural economies of Michigan and states in the Great Lakes region. The MSU breeding program operates essentially two soft wheat breeding programs targeting soft red and soft white wheat market classes.

To accomplish the goal of developing FHB-resistant wheat varieties and germplasm, the following Research Objectives will be completed each year in 2020 and 2021:
1. **Population Development**
   Two crossing cycles will be completed annually to develop 600 populations per year focused on FHB resistance. Populations will be generated that segregate for both FHB resistance and important agronomic traits including high grain yield. Rapid generation advancement in the greenhouse allows the MSU program to move from F_1 seed to F_4 seed in 16 months.
2. **Genomic Selection**
   Each year, genomic estimated breeding values (GEBVs) for FHB resistance and grain yield will be developed for 1,900 inbred lines. A set of 500 lines with high predicted grain yield low predicted DON and FHB index will advanced and evaluated in an irrigated disease nursery.
3. **Marker-Assisted Selection**
   Marker-assisted selection for *Fhb1* among inbred lines advanced from ~200 populations with *Fhb1* donor parents will be used to advance lines into replicated yield testing. Dwarfing genes and photoperiod sensitivity genes will also be used as selection criteria.
4. **FHB Phenotyping**
   A misted and inoculated FHB nursery will be used each year to phenotype 500 new breeding lines, 200 lines of the GS training population and 200 advanced breeding lines in replicated yield trials.
5. **Replicated Yield Testing**
   Phenology, visual FHB resistance and plant type will be used to advance 100-200 lines to replicated yield testing at up to six locations across the Great Lakes Region.
6. **Outreach**
   Data on FHB resistance in soft winter wheat varieties will be generated and communicated to Michigan wheat growers and agribusiness at meetings, field days and in extension publications. Communicating the varieties with high levels resistance as well as the value of planting resistant varieties will enable growers to make informed planting decisions and will support the goal of increasing soft wheat acres planted to resistant varieties.