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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 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 FHB resistance and important agronomic traits including high grain yield.

2. Genomic Selection

Each year, genomic estimated breeding values (GEBVs) for FHB resistance and grain yield will be developed for 2,800 inbred lines. A set of 700 lines with high predicted grain yield in combination with low predicted DON and FHB index will be advanced and evaluated in an irrigated disease nursery.

3. Marker-Assisted Selection

Marker-assisted selection for Fhb1 will be used to advance lines into replicated yield testing among inbred lines advanced from ~200 populations with Fhb1 donor parents. 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 700 new breeding lines, 200 lines of the GS training population and 250 advanced breeding lines in replicated yield trials at four locations in Michigan.

5. Replicated Yield Testing

FHB resistance and grain yield will be used to advance 32 lines to replicated yield testing at up to 14 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.