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PROJECT 1 ABSTRACT
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The overall goal of this project is to accelerate development of soft white and red winter wheat cultivars adapted to Michigan with improved resistance to Fusarium head blight (FHB) and deoxynivalenol (vomitoxin, VOM, DON). FHB has been an annual problem in Michigan for more than a decade. The majority of wheat cultivars grow in Michigan are susceptible to FHB. Michigan is the largest producer of soft white wheat in the Eastern U.S., and Michigan State University's wheat breeding program is one of two public programs in the Eastern U.S. (the other is directed by M.E. Sorrels at Cornell University) that focuses the majority of the program on soft white winter wheat. White wheat has been found to have higher levels of DON than red wheat when comparing varieties of comparable field symptoms, making the problem of FHB in Michigan especially serious.

Michigan State University has been actively involved in breeding for FHB resistance. Breeding with Chinese sources of FHB resistance has been strongly emphasized, but, yield trails have shown that the breeding lines produced have exhibit poor yield. Native sources of resistance may lend themselves more easily to higher yielding line. Some native sources of resistance have been used in crosses in the past, and we will create additional crosses with native sources of resistance, and work to combine native and Chinese sources of resistance.

In 2009, we began using Marker Assisted Selection (MAS) for Chinese sources of resistance to enrich populations from 3-way crosses, and select in early generations from 2-way crosses. By using MAS in early generations we are both 1) increasing our proportion of lines with desired resistance and 2) eliminating lines without the resistance. In addition, through early selection we also maintain as much variation as possible for other traits (such as yield) – making it more likely that we will be able to identify a higher yielding line in combination with resistance.

A brief overview of our plan of work is as follows: Crosses will be made between elite high yielding germplasm and FHB resistant germplasm. Marker Assisted Selection of known Quantitative Trait Loci (QTL) for resistance will be conducted in collaboration with the USDA/ARS Regional Small Grains Genotyping Lab (RSGGL, Raleigh, NC), and selections will be made based on these marker data. FHB phenotyping will be conducted in an inoculated and misted field nursery. Post-harvest assessment of Fusarium damaged kernels and DON will be conducted on selected lines/nurseries. Through these methods we expect to increase the FHB resistance in MSU's breeding lines, and have a greater change to develop commercial cultivars with both FHB resistance and high yield.