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Project ID: FY08-LE-125

FY07 ARS Agreement #: 59-0790-6-061

Research Category: VDHR-NWW

Duration of Award: 1 Year

Project Title: Development of FHB Resistant Soft White and Red Wheat Varieties for Michigan and Similar Environments.

PROJECT 1 ABSTRACT

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The overall goal of this project is to accelerate development of commercially viable varieties and advanced generation lines of soft white and red winter wheat which exhibit resistance to FHB and are adapted to Michigan and/or the eastern U.S. region. Michigan State University's wheat breeding program is one of two public programs in the eastern U.S. that focuses the majority of the program on soft white winter wheat (SWWW). FHB is a particularly serious threat to the SWWW acreage in Michigan because of the products produced from soft white wheat (SWW), with a large proportion being used by Michigan's cereal food industry. The importance of lowering levels of DON in SWW is amplified by the fact that bran mill fractions are regularly used in ready-to-eat cereal products, and bran fractions have been shown to contain higher levels of DON than flour streams (Hazel and Patel, 2004).

The majority of high yielding cultivars grown in Michigan have shown high levels of FHB under artificial inoculation (http://www.css.msu.edu/varietytrials/wheat/Variety_Results.html). Furthermore, DON accumulation in the majority of high yielding SWW cultivars in Michigan is also high (while those of red wheat are, on the whole, lower). In this project we will conduct targeted crosses for the development of high yielding cultivars with FHB resistance (including low DON accumulation), with an emphasis on improving soft white wheat FHB resistance and DON accumulation levels, though soft red varieties are also developed.

Three adapted MSU lines with Chinese derived resistance adapted to Michigan have been identified. These lines will be used in simple and 3-way crosses and backcrosses. Marker Assisted Selection (MAS) of FHB resistance QTL will be conducted in the progeny of these crosses to accelerate the selection of lines with FHB resistance.

A soft white winter high yielding MSU line (E2017) with improved FHB resistance and DON levels has also been identified. E2017 likely has a "native" source of resistance. E2017 will be used in simple and 3-way crosses with the Chinese derived FHB resistant lines, and in simple crosses with high yielding FHB susceptible materials. Crosses between the Chinese derived germplasm (in simple and/or 3-way crosses) and E2017 will enable us to begin pyramiding these sources of resistance to provide better protection to FHB.

Generations of breeding materials will be advanced with an emphasis on FHB resistance, incorporating screening for FHB resistance and low DON levels.

In addition to breeding for FHB resistant high yielding cultivars, MSU will screen several collaborative nurseries for FHB including the Northern Uniform Winter Wheat Scab Nursery (NUWWSN), Preliminary Northern Uniform Winter Wheat Scab Nursery (PNUWWSN), the Uniform Eastern Soft Red Winter Wheat Nursery (UESRWWN) and the Uniform Eastern Soft White Winter Wheat Nursery (UESWWN). Furthermore, MSU annually manages the Michigan State Performance Trial, which includes the commercially grown varieties in Michigan. The MI State Performance Trial is screened for FHB resistance and DON, in addition to testing for yield, testweight, pre-harvest sprouting, quality, and other traits of interest for growers and industry.