

PI: Clay Sneller

PI's E-mail: sneller.5@osu.edu

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Project Title: Discovering, Understanding, and Utilizing Wheat Genes for FHB Resistance in Ohio.

PROJECT 1 ABSTRACT

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Fusarium Head Blight (FHB) causes extensive yield and quality losses. In 2006, high DON levels in Ohio forced some mills to import non-FHB infested grain. The deployment of high-yielding FHB resistant varieties is a critical component of effective economic control. Breeding for FHB resistance is difficult due to low heritability and complex genetics. Breeding resistance requires screening many lines to combine FHB resistance with the other traits required in an economically viable cultivar. Improving FHB resistance efficiently requires both phenotypic selection and molecular breeding. It is our objective to use traditional and molecular breeding technologies in a program that will insure a steady release of FHB resistant cultivars while building parents for future success. Our objectives are:

1. Generate new populations of inbred lines from parents chosen to facilitate recombination of genes from elite and exotic sources for yield, adaptation to Ohio, and resistance to FHB and other diseases
2. Use parents generated by molecular breeding as parents to pyramid QTL for FHB resistance
3. Use best lines in crossing program to initiate backcross and recurrent selection populations.
4. Screen inbred lines for FHB resistance in misted and inoculated FHB nurseries
5. Evaluate the FHB resistance of the soft winter wheat TCAP elite panel.

Breeder's need to produce a steady stream of new cultivars each year with desired agronomics, yield potential, quality, and FHB resistance. This can be achieved by integrating parent building, phenotypic selection, and directed use of molecular breeding for FHB resistance in a good genetic base. The genetic base of the OSU program has considerable native resistance (6,8) (Fig. 1). Even OSU lines previously unselected for FHB resistance (Year 1 breeding lines, Fig. 1) show a very high frequency of useful resistance almost exclusively from native sources. The OSU program is also successfully combining native FHB resistance with yield. These OSU lines and many others are already being used in forward and backcrosses that use marker-assisted selection for Fhb1.

We have continued to expand our field testing. All of our breeding material (~1,350 lines per year) is evaluated for FHB resistance the misted-inoculated nursery and is also in yield trials. In addition we spray inoculate 8,000 head rows. Thus we will attempt to phenotype ~9,300 OSU breeding lines for FHB resistance.

We have constructed an elite panel of 280 soft winter wheat lines via the Triticeae Coordinated Agricultural Program (TCAP). These lines have been genotyped using a 90K SNP chip and will be genotyped using genotyping-by-sequencing techniques. This ready-made population and genotypic data set is well suited to association analysis to identify QTL for FHB resistance in soft winter wheat.