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Project Title: Enhancing FHB Resistance by Epigenetic Modification of Durum Cultivars

PROJECT 1 ABSTRACT

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Durum lines that are genetically resistant to FHB are critical to continued production of this important crop in the US. Despite effort of DUR-CP researchers and advances in recent years, there is a need to develop even more resistant durum cultivars. Various studies suggest that either the cultivated durum genome carries a suppressor of FHB resistance or is missing enhancers of resistance on D-genome chromosomes. To test these hypotheses, we treated several popular durum cultivars with a chemical mutagen that removes CG methylation. These lines were advanced and tested for FHB resistance with about 20 lines identified that show great promise. Our repeated tests over several years in field nurseries (various locations in ND and MN) and greenhouse screening have identified 5 lines that are significantly more resistant than parental lines and durum checks. These lines also have significantly lower FDK and DON. We have crossed these lines to popular durum cultivars aimed at testing the stability and inheritance of resistance. Additionally, we have obtained RNA sequence data from various tissues with and without *Fusarium* infection from two of these lines along with controls, to determine epigenetic changes that are responsible for the enhanced resistance.

The specific objectives of this project are to:

1. characterize the stability and inheritance of epigenetic changes in FHB resistant durum lines produced by altering the DNA methylation patterns,
2. profile the transcriptome changes that have occurred as a result of epigenetic modification in resistant durum lines, and
3. validate altered gene expression patterns and characterize candidate genes for use as perfect molecular markers in breeding.

The ultimate objective of this project is to enhance FHB resistance in durum cultivars by removal of persistent suppression mechanism. Through this project we aim to develop lines with enhanced FHB resistance and associated molecular markers that can be incorporated into durum breeding programs.