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PROJECT 1 ABSTRACT

(1 Page Limit)

The complex inheritance of FHB resistance in durum backgrounds has limited the deployment of FHB resistance genes in durum wheat. In addition, the wheat D genome may play a role in the expression of FHB resistance genes. Our results indicate that some of the hexaploid-derived FHB resistance genes exhibit different inheritance patterns in durum. Also, we have observed significant variation in FHB resistance among the durum D-genome chromosome substitution and addition lines, suggesting the effect of D-genome chromosomes on FHB resistance. We have developed 114 advanced durum introgression lines from large segregation populations derived from multiple crosses involving hexaploid resistance sources and adapted durum cultivars. Some of them exhibited improved FHB resistance in multiple greenhouse and field seasons. FHB resistance of those durum lines have been verified under field conditions at three locations (Fargo, Prosper, and Langdon) in North Dakota and two locations (Hangzhou and Jianyang) in China. The durum lines with consistent resistance across the locations have been provided to the durum breeding program for potential use in variety development. Here we propose to characterize inheritance of hexaploid-derived FHB resistance in two large RIL populations (n>200) derived from the crosses of Sumai 3 and PI 277012 (two major hexaploid FHB resistance sources) and Langdon durum and to incorporate FHB resistance from hexaploid wheat into durum for germplasm development. Also, we will further investigate the effect of D-genome chromosomes on FHB resistance in the durum background. We will continue to evaluate the RIL populations for FHB resistance in the greenhouse and to genotype them using wheat 90K SNP arrays.

The specific objectives of this project are to:

1) Characterize inheritance of the hexaploid-derived FHB resistance genes in durum background and understand the effect of D-genome chromosomes on FHB resistance;
2) Incorporate hexaploid wheat-derived FHB resistance genes into durum for germplasm development; and
3) Develop and validate the molecular markers tagging FHB resistance QTL in the durum germplasm.
4)

We anticipate developing additional durum germplasm with enhanced FHB resistance and potentially reduced DON accumulation in the next funding period. They will be made available immediately for variety development. Meanwhile, this study will enhance understanding of inheritance and expression of FHB resistance genes in the durum background. Ultimately, this research project will facilitate efficient introgression and deployment of the hexaploid-derived FHB resistance genes into durum for germplasm and variety development.