

## Project Abstract

<b>Project Title:</b>	Introgression and Understanding of Hexaploid-derived FHB Resistance Genes in Durum	
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The complex inheritance of FHB resistance in durum backgrounds has limited the deployment of FHB resistance genes in durum varieties. The goals of this project are to understand the complex inheritance and epistatic effects of FHB resistance genes in the durum background, and to deploy FHB resistance genes in the adapted spring and winter durum genotypes for germplasm/variety development. We have detected new FHB resistance QTL in the RIL populations of the LDN durum x PI 277012 and LDN x Sumai 3 in addition to the resistance QTL identified in the hexaploid FHB-resistant parents PI 277012 and Sumai 3. In addition, we have found the phenotypic effects of the hexaploid-derived resistance QTL have been changed in the tetraploid backgrounds. All these results indicate that the hexaploid-derived FHB resistance genes perform differently in the tetraploid durum backgrounds, suggesting the epistatic effects of FHB resistance genes with others in durum. Recently, we have developed a small wheat-*Thinopyrum elongatum* 7B-7E translocation line containing FHB resistance gene *Fhb7* and diagnostic KASP markers for *Fhb7*, making this wild grass-derived FHB resistance gene usable in durum. Also, we have been developing new RIL populations involving adapted spring and winter durum varieties and major hexaploid FHB resistance sources to identify and map FHB resistance in durum, and to select FHB-resistant recombinants for germplasm development. Here, we propose to characterize the inheritance and epistasis of hexaploid-derived FHB resistance genes in durum by the targeted chromosome substitution and molecular mapping, and to incorporate FHB resistance genes into durum for germplasm development by enforcing targeted critical chromosome recombination in the near-isogenic adapted backgrounds. The specific objectives of this project are to:

- 1) Transfer the whole chromosome containing major FHB resistance QTL from hexaploid to adapted durum varieties by alien chromosome-mediated substitution (*Year 1-2*);  
*Expected outcomes: The substitution lines with the targeted hexaploid chromosomes containing major FHB resistance QTL in the adapted durum backgrounds.*
- 2) Characterize inheritance and epistasis of the hexaploid-derived FHB resistance genes in the near-isogenic adapted durum backgrounds by targeted chromosome substitution and recombination (*Year 2-4*);  
*Expected outcomes: Better understanding of the hexaploid-derived FHB resistance genes in the adapted durum backgrounds.*
- 3) Select the targeted chromosome recombinants with FHB resistance in the adapted durum backgrounds for germplasm/variety development (*Year 3-4*).  
*Expected outcomes: FHB-resistant durum germplasm/varieties.*

Ultimately, this research project will enhance the introgression and deployment of hexaploid-derived FHB resistance genes into durum for germplasm and variety development.