Project Abstract

Project Title:	Transferring Fusarium Head Blight Resistance Gene *Fhb7* to Barley	
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The lack of effective resistance sources has limited the progress of breeding for FHB resistance in barley. Moderate resistance to FHB has been identified and extensively characterized in wheat and wild species. They represent a potential source of resistance to strengthen the defense of barley to FHB. The goals of this project are to transfer FHB resistance genes from wheat and wild grass to barley by homoeologous recombination-based chromosome engineering, and to develop barley germplasm/ varieties with improved FHB resistance. Our recent studies on other diploid grass species indicate diploids may take small homoeologous recombination-mediated alien introgression without apparent deleterious effects. A recent study published in Science indicates that the wild grass *Thinopyrum*-derived FHB resistance gene *Fhb7* detoxifies DON and other mycotoxins produced by the Fusarium fungi, representing an invaluable resistance source for improving FHB resistance and reducing DON accumulation in barley. *Fhb7* can be potentially utilized to strengthen resistance of barley to FHB by introducing it into the barley genome through meiotic homoeologous recombination. Here, I propose to incorporate the *Thinopyrum*-derived FHB resistance gene *Fhb7* into barley by genomics-enabled chromosome engineering and to develop FHB-resistant barley germplasm/varieties. The specific objectives of this project are to:

1) Induce meiotic recombination of *Thinopyrum* chromosome 7E (*Fhb7*) with its barley homoeologue 7H using wheat *ph1b* mutant (*Year 1-2*).
   Expected outcomes: Enhanced meiotic pairing and recombination for the homoeologous pair 7H-7E.
2) Recover 7H-7E recombinants containing *Fhb7* using molecular markers and fluorescent *in situ* hybridization (FISH)/genomic *in situ* hybridization (GISH) (*Year 2-3*)
   Expected outcomes: Small 7H-7E recombinants containing Fhb7.
3) Develop barley germplasm/varieties containing *Fhb7* (*Year 3-4*).
   Expected outcomes: Barley germplasm/varieties with potentially improved FHB resistance.

Ultimately, we anticipate developing barley germplasm containing *Fhb7*. Meanwhile, we will expect to develop a novel alien introgression pipeline for germplasm/variety development in barley and provide a better understanding for the function of the wild species-derived FHB resistance gene in barley.