

Project FY22-GD-011: Genotype-independent Transformation in Barley

1. What are the major goals and objectives of the research project?

- 1) To obtain transgenic barley plants using recalcitrant varieties other than Golden Promise.
- 2) To obtain transgenic barley plants using the GRF-GIF chimera.
- 3) To transfer the *FHB7* gene to Bowman.
- 4) To test FHB severity with the *FHB7*-transgenic plants in both greenhouse and field conditions.

2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

What were the major activities?

- 1) Cloned the CRF-GIF chimera to the destination vector.
- 2) Transfer *FHB7* to Bowman.
- 3) Evaluation of *FHB7*-transgenic plants under field conditions.
- 4) Development of a ternary vector system carrying a mutated virG that confers constitutive virulence gene expression.
- 5) Tested the ternary vector system in cereals, including wheat, maize, and barley.
- 6) Development of altruistic vectors using development genes to increase transformation efficiency and reduce regeneration time.

What were the significant results?

- 1) We developed a stable protocol for barley transformation in Golden Promise and Bowman.
- 2) We improved barley transformation efficiency in recalcitrant genotypes.
- 3) The barley ortholog of *FHB1* (*HvHRC*) in Golden Promise and Bowman was knocked out.
- 4) Homozygous mutant plants were obtained.
- 5) Plant regeneration time was reduced.
- 6) Transfer of *FHB7* enhanced FHB resistance in barley based on the 2023 field data.

List key outcomes or other achievements.

- 1) We developed a genotype-independent transformation protocol in barley.
- 2) We set up an efficient CRISPR protocol in barley.
- 3) Plant regeneration time was reduced.
- 4) *FHB7* is functional for FHB resistance in barley.

3. What opportunities for training and professional development has the project provided?

This project provided a Postdoc Researcher and an undergraduate student with training on barley transformation and gene editing.

4. How have the results been disseminated to communities of interest?

We presented our preliminary results at the 2023 National FHB Forum.

5. What do you plan to do during the next reporting period to accomplish the goals and objectives?

Field test and greenhouse tests with more replicates will be conducted to confirm the preliminary data that *FHB7* function is conserved in barley.