

ANNUAL REPORT

Grant Code: AP5484

Title: Breeding Durable and High Level of Dwarf Bunt Resistance Using Molecular Marker-Assisted Selection

Personnel: Drs. J. Chen, R. Chowdhury, R. Wang, Ms. P. Joshi, Mr. J. Wheeler

Collaborators: Drs. D. Hole, J. Marshall, T. Gordon

Address: Dr. Jianli Chen, University of Idaho (UI) Aberdeen Research & Extension Center, Aberdeen, ID 83210; 208-397-4162, ext. 229; jchen@uidaho.edu.

Accomplishments

This year we obtained a highly competitive grant award from the USDA-NIFA-AFRI Plant Breeding Partnership Program entitled “Genomics-enabled wheat breeding to accelerate development of dwarf bunt resistant cultivars”. This grant will support the training of a postdoctoral fellow and two graduate students in the areas of plant breeding, genetics, genomics, phenomics, and molecular biology. The funding from this grant and the past IWC support should enable us within three years to release dwarf bunt resistant cultivars with multiple bunt resistant genes and identify candidate genes controlling dwarf bunt resistance. Additional progress during the past year includes:

1. A large panel of 384 released cultivars and elite lines collected in the PNW was planted in two replications in the Logan Utah nursery in the fall of 2021 and will be assessed for dwarf bunt resistance in two growing seasons. The data will be used to develop a genomic selection prediction model for the new NIFA funded project.
2. One hundred elite lines were planted in two replications in fall of 2021 and assessed for dwarf bunt resistance in the Logan nursery in the summer of 2022. These lines were also planted and assessed for agronomic performance in multiple environments in Idaho.
3. A UI Silver M2 population (406 lines) was planted and inoculated in a field nursery in Logan and an additional 300 lines were seed-inoculated with common bunt in the greenhouse.
4. A fine-mapping population for the 6DL QTL has been seed-inoculated with common bunt in the greenhouse and the fine-mapping work will be conducted by a new graduate student, Ms. Pabitra Joshi in 2022.
5. We have initiated a gene editing project for the candidate gene of the 7DS QTL.

Oral Presentations:

Chen, J., R. Chowdhury, D. Hole, M. Krause, T. Gordon. 2021. Assessment of two quantitative trait loci for dwarf bunt resistance in winter wheat grown in Pacific Northwest of the USA. Proceeding of XXI international bunt and smut workshop. Virtual meeting. May 5 – 6, 2021.

Chen, J., D. Hole, M. Krause, T. Gordon., and J. Zhang. 2021. Molecular breeding for resistance to critical bunt diseases in organic wheat production. 2021 International ASA, CSSA, and SSSA. Salt Lake City, UT. Nov. 6 – 10, 2021.

Challenge Encountered: Because of drought conditions, the level of infection in the Logan disease nursery was too low to score in 2021. The postdoc who worked on this project left for a USDA position in June. However, Ms. Joshi arrived in time to help with harvesting in Logan nursery and she will work on this project for her Ph.D. program in coming three years.

Projections:

We gratefully acknowledge the IWC support on dwarf bunt resistant cultivar development and genomics research during the past four years. Your support was vital. It enabled us to generate foundational data to compete for the prestigious NIFA funding with which we will continue the bunt work in 2022 to 2024.