UNIVERSITY of GUELPH

COLLEGE of BIOLOGICAL SCIENCE

DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY

Announcement:

All interested members of the university community are invited to attend the Final Oral Examination for the degree of ***Master of Science*** *of*

REID BUCHANAN

On Monday, March 6, 2023 at 1:30 p.m. (SSC 1511)

Thesis Title: **Proteomic insights into the mechanisms of deoxynivalenol resistance in *Triticum aestivum***

Examination Committee:

Dr. Michael Emes, Dept. of Molecular and Cellular Biology (Exam Chair)
Dr. Jennifer Geddes-McAlister, Dept. of Molecular and Cellular Biology
Dr. Mitra Serajazari, Dept. of Plant Agriculture
Dr. Stephen Seah, Dept. of Molecular and Cellular Biology

Advisory Committee:

Dr. Jennifer Geddes-McAlister (Advisor)
Dr. Rebecca Shapiro
Dr. Mitra Serajazari

Abstract: Fusarium head blight (FHB) is a globally relevant cereal crop disease resulting from infection with fungal pathogens, including *Fusarium* spp., with *Fusarium graminearum* being the primary causative agent. A distinctive and devastating factor of this disease is the production of deoxynivalenol (DON), a mycotoxin, which inhibits eukaryotic protein synthesis to weaken and kill cells in infected host tissues, as well as threaten food safety for humans and livestock. In this thesis, I investigated the regulation of host response to infection with the known virulence factor of FHB, deoxynivalenol. My findings elucidated our understanding of distinct DON detoxification responses corresponding to these parameters (i.e., 24 vs. 120 h post-inoculation, low [0.1 mg/mL] and high [1.0 mg/mL] DON, FHB-resistant vs. -susceptible cultivars) through the production of proteins known to detoxify DON and with hypothesized DON-detoxifying capabilities (e.g., glutathione transferases and glycosyltransferases). Next, I developed an *in vitro* assay for the quantification of DON-degrading capabilities for these prioritized candidate proteins. Continuing to develop our understanding of the biochemical methods used to mitigate the effects of DON *in planta* is a useful approach to identifying biomarkers for selective breeding of mycotoxin-resistant cultivars in the future.

Curriculum Vitae: Reid completed his Bachelor of Science (Hons.) in Biochemistry (Co-op) at the University of Guelph in 2019. He began his Master of Science program in Molecular and Cellular Biology under the supervision of Dr. Jennifer Geddes-McAlister in September 2020 and has been a MITACS Intern during his program.

Publications: Liu, B., Stevens-Green, R., Johal, D., **Buchanan, R.**, Geddes-McAlister, J. (2021). Fungal pathogens of cereal crops: Proteomic insights into fungal pathogenesis, host defense, and resistance. *J Plant Physiology*.

Continued…

Liu, B., Johal, D., **Buchanan, R.**, Ball, B., Serajazari, M., Geddes-McAlister, J. (*In Press*) Quantitative phosphoproteome analysis of a cereal crop fungal pathogen's interaction with the host. *Methods Mol Biol: Plant-Pathogen Interactions*

Buchanan, R., Serajazari, M., Geddes-McAlister, J. (*In Press*) Proteomic profiling of host response in the cereal crop *Triticum aestivum* to the mycotoxin, 15-acetyldeoxynivalenol, produced by the fungal pathogen, *Fusarium graminearum. Methods Mol Biol: Plant-Pathogen Interactions*