COLLEGE *of* BIOLOGICAL SCIENCE

DEPARTMENT OF MOLECULAR
AND CELLULAR BIOLOGY

UNIVERSITY *of* GUELPH

Announcement:

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

MEHDI SHABANIAN

on Thursday, May 2nd, 2024 at 9:30 a.m. (SSC 2315)

Thesis Title: **Study of the Seasonal Dynamics of Grapevine Leafroll Associated Viruses under Cool Climate Conditions, and the Optimization of a Protocol to Initiate Grapevine Infections with Viral Infectious Clones.**

Examination Committee:

Dr. Terry Van Raay, Dept. of Molecular and Cellular Biology (Exam Chair)
Dr. Peter Krell, Dept. of Molecular and Cellular Biology
Dr. Baozhong Meng, Dept. of Molecular and Cellular Biology
Dr. Jaideep Mathur, Dept. of Molecular and Cellular Biology
Dr. Aiming Wang, Dept. of Biology, University of Western Ontario (External Examiner)

Advisory Committee:

Dr. Baozhong Meng (Adv)
Dr. Peter Krell
Dr. Sarah Wootton
Dr. Andrew Reynolds

Abstract: *Grapevine leafroll-associated virus* 2 (GLRaV-2) and GLRaV-3 of the *Closteroviridae* family are involved in grapevine leafroll disease, the most widespread and destructive disease of grapevine worldwide. Despite recognition of the importance of this viral disease, there was no information regarding the seasonal dynamics of both viruses among different tissue types under cool climate conditions. Therefore, in this research, temporal fluctuation and spatial distribution of these viruses were studied among different tissues collected from May to October by using RT-PCR, RT-qPCR and Western blotting. The results showed that leaves collected in September have the highest titer for both viruses compared to petioles and berries. In contrast, berries collected in June had the highest virus titer compared to other tissues. Furthermore, we have shown that the level of viral RNA and capsid protein of both viruses in leaves had the lowest titer in early season (May and June) but increased to the highest titer toward the end of season (September and October).

In the second line of research, four different agro-infection methods (drenching, pricking, injecting and vacuum-based infiltration) were used to study their effectiveness in launching infection through agro-infiltration of viral cDNA clones as a way to deliver into grapevine tissue-cultured plantlets. The results have shown that the most effective method is the vacuum-based

infiltration. Subsequently, the impacts of different factors such as the age of plantlets, humidity, cold treatment (dormancy) and the inclusion of RNA silencing suppressors (RSS) were examined in optimization of vacuum-based infiltration to improve the survival and consequently the infectivity rates. The rate of infection was calculated using different assay methods such as nested RT-PCR, RT-qPCR and Western blotting. Findings from this research showed that humidity is a key in survival and ultimately the infection percentage. The other factors such as age of the plantlets, dormancy and RSS usage showed to have strong effects on the infection rates.

Curriculum Vitae: Mehdi obtained his B.Sc. in Plant Pathology and his M.Sc in Plant Virology with honors at the University of Kerman, in Iran and subsequently worked as an instructor for 5 years at the University of Kerman. After immigrating to Canada, and adjusting himself to the new environment he first joined Dr. Meng's laboratory as a research assistant. In Fall 2015, Mehdi started his M.Sc degree program in virology and later in Spring 2018 he transferred to his Ph.D. in the department of Molecular and Cellular Biology, University of Guelph.

Publications and Meeting Presentations: Xiao, H., **Shabanian, M**., McFadden-Smith, W., and Meng, B. **2016**. First report of Grapevine Pinot gris virus in commercial grapes in Canada. Plant Disease, 12(15): 1405.

Shabanian, M., Xiao, H., and Meng, B. **2018**.Temporal dynamics and spatial distribution of major grapevine viruses under cool climate field conditions in Ontario. **Proceedings of the International Council for the Study of Virus and Virus-like Diseases of the Grapevine, Chile 19: 26-27.**

Xiao, H., **Shabanian, M**., Moore, C., Li, C., and Meng, B. **2018**. Survey for major viruses in commercial *Vitis vinifera* wine grapes in Ontario. Virology Journal, 15 (127): 1-11.

Shabanian, M., Xiao, H., and Meng, B. **2020**. Seasonal dynamics and tissue distribution of two major viruses associated with grapevine Leafroll under cool climate condition. European Journal of Plant Pathology, 158: 1017-1031.

Li, C., **Shabanian, M**, Fust, C., and Meng, B., **2023**. Blazing a new trail to elucidate the molecular and cellular biology of GLRaV3. **Proceedings of the International Council for the Study of Virus and Virus-like Diseases of the Grapevine, Greece 20: 35-38.**

Shabanian, M., Li, C., Ebadi, A., Dolja, V., Meng, B. **2023.** Optimization of a protocol to launch infection of grapevine with viral infectious clones. Pathogens, 12(11):1314-1335.

Dorin, B., Reynolds, A. G., Lee, H. S., Carrey, M., Shemrock, A., and **Shabanian, M**. **2024**. Detecting cool-climate Riesling vineyard variation using unmanned aerial vehicles and proximal sensors. Drone Systems and Applications, 12: 1-18.

Shabanian, M., Xiao, H., and Meng, B. **2024**. Probing into the diversity and temporal dynamics of grapevine viruses involved in the rugose wood disease in Ontario. In preparation.