

Plant Pathology Seminar Series

“Antagonistic dialogues in tripartite interactions among potato-protist-virus”

Hira Kamal, Post-doctoral Fellow
Pappu and Tanaka Labs
Department of Plant Pathology

Abstract:

Potato is the most important vegetable crop worldwide. Potato production in the US, including states of Idaho, Oregon and Washington is affected by powdery scab (PS) disease caused by the soil-borne protist, *Spongospora subterranea* f. sp. *subterranea* (Sss). Disease symptoms include cosmetic damage to tuber skin and the formation of root galls (Falloon et al., 2011). Not much is known about the molecular interaction between powdery scab and its host, potato. Root galls exhibit in different shades of color, from white to brown, depending on the stage of the disease. A microscopic examination of white and brown galls was carried out using scanning electron microscopy and light microscopy. SEM revealed that white gall samples possess starch granules to start initiation of the spore ball formation suggesting that Sss consumed plant starch for sporangia formation. While the mature, brown galls had abundant spore balls without any starch granules. These results suggested that Sss manipulates the plant root system by inducing starch biosynthesis ectopically, which provide biochemical and molecular insights into the plant-protist interaction.

Sss also acts as a vector for another pathogen, potato mop top virus (PMTV) (Harrison et al., 1997; Johnson and Cummings, 2015). To investigate the antagonistic interaction between PMTV and potato, a mechanical inoculation assay is being optimized using in vitro produced infectious transcripts of PMTV. Preliminary results showed the successful infection and replication of PMTV in inoculated *Nicotiana benthamiana* leaves. This assay will be used in our future transcriptomics and Gene Co-expression Network analysis. Additionally, the role(s) of PMTV-encoded proteins are being studied using a potato virus X (PVX)-based expression system in model plant *N. benthamiana*. The coat protein (CP), and triple gene block (TGB)-3 of PMTV were expressed in plants and their effect on plant phenotype were monitored. Plants expressing the TGB3 and CP showed mild symptoms with leaf crumpling and downward curling and yellowing in newly emerging younger leaves. When CP and TGB-3 were expressed together, plants produced a hypersensitive response and had severe symptoms on local and systemic leaves. These results suggest that CP and TGB3 play a potentially important role in symptom development for PMTV infection. Insights into the tri-partite interactions among Sss, PMTV and their host, potato could lead to the development of management strategies of this economically important disease complex of potato.

References: Falloon, R.E., Merz, U., Lister, R.A., Wallace, A.R., and Hayes, S.P. (2011). Morphological enumeration of resting spores in sporangia of the plant pathogen *Spongospora subterranea*. *Acta Protozoologica* 50(2), 121.

Harrison, J., Searle, R., and Williams, N. (1997). Powdery scab disease of potato-a review. *Plant Pathology* 46(1), 1-25.

Johnson, D.A., and Cummings, T.F. (2015). Effect of powdery scab root galls on yield of potato. *Plant Disease* 99(10), 1396-1403.

4:10 pm | Date January 30th, 2023 | Plant Pathology 515, Spring 2023

Zoom Link: <https://wsu.zoom.us/j/95501196325?pwd=aGdCeTZGM0pQaXZoY05qT3M0SFVHQ09>

Meeting ID: 955 0119 6325 **Passcode:** 5498

Call in number: 1 253 215 8782



WASHINGTON STATE
UNIVERSITY