

Plant Pathology Seminar Series

Disease-Suppressive Soils as a Tool for Disease Management

Roshani Baral
M.S. Student

Abstract

As soilborne diseases continue to challenge crop production, suppressive soils offer a way to manage the disease condition even in the presence of a susceptible host and a virulent pathogen. To date, several microbial species have been identified as contributors to disease suppression. Introducing such strains to problematic soils can offer long-term disease control (Liu et al. 1995) and may promote plant growth (Meng et al. 2012). In this talk, I will present the role of suppressive soils to manage pathogens such as *Streptomyces scabies* (causing common scab of potato) (Liu et al. 1995; Meng et al. 2012), *Fusarium oxysporum* (causing Fusarium wilt) (Cha et al. 2016), and *Gaeumannomyces graminis* var. *tritici* (causing take-all of wheat) (Raaijmakers and Weller 1998). I will also discuss the attributes of disease-suppressive soils, mechanisms involved in disease suppression, and understand the importance of soil microbiomes in disease management (Jayaraman et al. 2021).



Picture: Sugar beet plants grown on suppressive and conducive soil inoculated with *Rhizoctonia solani* (Carrión et al. 2019)



References

- Carrión, V. J., Perez-Jaramillo, J., Cordovez, V., Tracanna, V., De Hollander, M., Ruiz-Buck, D., Mendes, L. W., Van Ijcken, W. F. J., Gomez-Exposito, R., Elsayed, S. S., Mohanraju, P., Arifah, A., Van Der Oost, J., Paulson, J. N., Mendes, R., Van Wezel, G. P., Medema, M. H., and Raaijmakers, J. M. 2019. Pathogen-induced activation of disease-suppressive functions in the endophytic root microbiome. *Science* 366:606–612.
- Cha, J. Y., Han, S., Hong, H. J., Cho, H., Kim, D., Kwon, Y., Kwon, S. K., Crusemann, M., Bok Lee, Y., Kim, J. F., Giaever, G., Nislow, C., Moore, B. S., Thomashow, L. S., Weller, D. M., and Kwak, Y. S. 2016. Microbial and biochemical basis of a *Fusarium* wilt-suppressive soil. *The ISME Journal* 10:119–129.
- Jayaraman, S., Naorem, A. K., Lal, R., Dalal, R. C., Sinha, N. K., Patra, A. K., and Chaudhari, S. K. 2021. Disease-suppressive soils- Beyond food production: a critical review. *J Soil Sci Plant Nutr.* 21:1437–1465.
- Liu, D., Anderson, N. A., and Kinkel, L. L. 1995. Biological control of potato scab in the field with antagonistic *Streptomyces scabies*. *Phytopathology* 85:827–831.
- Meng, Q., Yin, J., Rosenzweig, N., Douches, D., and Hao, J. J. 2012. Culture-based assessment of microbial communities in soil suppressive to potato common scab. *Plant Dis.* 96:712–717.
- Raaijmakers, J. M., and Weller, D. M. 1998. Natural plant protection by 2,4-diacetylphloroglucinol-producing *Pseudomonas* spp. in take-all decline soils. *MPMI.* 11:144–152.