



# Polyetic development of the obligate biotrophic plant pathogen *Peronospora destructor*

Oral Defence by Ph.D. Candidate Hervé Van der Heyden

Plant Science

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## Abstract

Since the mid-2000s, southwestern Québec growers have experienced a steady increase in Onion Downy Mildew (ODM) occurrence and severity. The disease is caused by the obligate biotrophic oomycete *Peronospora destructor*, which can develop local and systemic infections and produce numerous sporangia. Many downy mildews spread northward during the growing season along a disease wavefront that progresses through sporangia dispersal from southern to northern growing areas. In southwestern Québec, this annual infection cycle is primarily driven by

collected over 31 consecutive years, I confirmed that regional disease incidence is mainly influenced by temperature and rainfall at harvest the previous fall, winter coldness, and disease incidence the previous year. Subsequently, I developed a specific qPCR assay to detect *P. destructor* inoculum in the soil. Finally, using genotyping by sequencing and population genetics, I determined that the population structure was characteristic of clonal organisms, suggested a heterothallic mode of reproduction and confirmed a significant effect of region on genetic variation. Together, these results showed that the impact of climate change in southwestern Quebec, with warmer fall temperatures and milder winters, favored the survival of overwintering inoculum, leading to a transition towards a polyetic development.

## About the Candidate

Hervé Van der Heyden holds an M.Sc. in Plant Science from McGill University and a B.Sc. in Biology from the Université de Montréal. Since his first contact with plant pathology research, he has been fascinated by the way pathogens disperse among plants, fields, and throughout a landscape. He worked as a plant pathologist for Phytodata, a research organization owned by a group of vegetable producers in southern Quebec. At the beginning of his doctoral studies, Hervé became interested in what happens between seasonal epidemics (i.e., transfer and overwintering) and over several seasons. In recognition of his research and outreach efforts, Hervé received the Achievements in Plant Disease Management award from the Canadian Phytopathological Society in July 2021.