



# IMPACT OF *BRASSICA JUNCEA* L. BIOFUMIGATION ON ANNUAL WEED ECOLOGY AND POPULATION DYNAMICS IN ORGANIC SOIL

Oral Defence by PhD Candidate Maxime Lefebvre

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## Abstract

Biofumigation is an innovative technique to control soilborne pests and weeds via a mass release of isothiocyanates (ITCs) in soil. The project focused on assessment of weed species susceptibility, surviving weed responses, and key population dynamic process changes in response to allelochemicals generated during biofumigation. A laboratory experiment examined relationships amongst seed dormancy, seed morphology, and weed seed susceptibility to biofumigation. The experiment demonstrated that the dormancy state was an important factor related to seed germination, seed mortality, and changes in seed dormancy. Laboratory and greenhouse experiments assessed the impact of biofumigation on fitness components of surviving weeds. Biofumigation modifies weed fitness by reducing seed germination and survival, promoting seedling mortality, and deferring emergence. A three-year field experiment assessed seasonal variation and long-term impact of biofumigation on weed community and population dynamics. As the amount of ITC detected increased in 2015 and 2016, Indian mustard reduced weed establishment within the cover crop growth, and post-incorporation weed spring emergence. Biofumigation technique realized in good conditions may lead to lower weed species richness and diversity. Overall, the project provides a comprehensive understanding of mechanisms of weed population and community responses to Indian mustard biofumigation.



## About the Candidate

Maxime obtained his bachelor's degree in ecology at the Université de Sherbrooke in 2008 and his master degree in biology at Université du Québec à Montréal (UQAM) in November 2010. Since January 2010, Maxime works as a research professional in weed science at the Research and Development Institute for the Agri-environment (IRDA). He registered in September 2013 for doctoral study in the department of Plant Science at McGill University. Since then, Maxime gets his thoughts on the impact of biofumigation on weed ecology, supervised by Professor Alan Watson and Maryse Leblanc.