

Opportunities for Three Ph.D. Positions

Effects of sustainable agricultural practices on pesticide reduction and accumulation in terrestrial agroecosystems, on soil biodiversity and on trophic interactions



Background

Pesticides alter the health and functions of soils that provide important contributions from nature to humanity, thereby compromising agricultural yields. The presence of pesticides in aquatic environments has also been documented. The effects of these pesticides on ecosystem health and on soil biodiversity are relatively unknown. With a growing interest for sustainable agricultural practices, assessing the impact of pesticides (and their mixtures) on biota and on the interactions between trophic levels, as well as on the ecosystem functions of agroecosystems in transition is a priority. **A partnership research project between the Institut national de la recherche scientifique (INRS), Agriculture and Agri-Food Canada (AAFC), Laval University, University of Montreal and the University of Quebec in Montreal (UQAM) began in the summer 2022 and we are currently recruiting three Ph.D. candidates to the research team.**

Academic profile sought

Candidates must hold a Master's degree in biological sciences, agronomy, molecular biology, microbiology or any other discipline relevant to the field of study.

Skills and interests sought

- Curious, dynamic and forward-thinking
- Experience with laboratory and field work
- Meticulous, rigorous and autonomous
- Strong teamwork and communication skills

Terms

A salary in the form of a scholarship will be paid (\$21,000/year). Applicants can register to start ideally in January 2023. Selected individuals will become members of the new [Quebec Network for Research in Sustainable Agriculture](#) (RQRAD) and will participate through their research projects in the realization of the new [Sustainable Agriculture Plan 2020-2030](#) which Quebec has just adopted.

Valuing equity, diversity and excellence, the RQRAD encourages all of its members to offer an inclusive and safe work environment. For the RQRAD, diversity is a source of wealth, and we encourage qualified people of any origin, sexual orientation, gender identity or expression as well as people with disabilities to apply.

Research project

From nutrient cycling to the formation of soil aggregates to the regulation of greenhouse gases, a myriad of biogeochemical processes take place in soils and, in the vast majority of these processes, microorganisms represent the metabolic engine. A growing number of studies suggest that soil biodiversity contribute to the multifunctionality of soils. Thus, soils with a higher diversity of organisms are generally healthier, more fertile, and offer more varied ecosystem functions. The use of pesticides generally reduces soil biodiversity and modifies community structure. Agricultural intensification has accelerated the loss of soil biodiversity and, therefore, contributed to the reduction of about 60% of soil-related ecosystem services. Habitat loss due to agricultural intensification and the use of pesticides and synthetic agricultural fertilizers is the determining factor in the decline of certain groups of arthropods, in addition to climate change.

The project is based on two main objectives:

- 1) Measure the impact of pesticide reduction on the diversity, abundance and structure of soil microbial communities (**PhD 1**) and soil micro/macro-arthropod communities (**PhD 2**) and on their interactions. Soil characteristics, as well as the accumulation of pesticides in soils and living organisms, will also be monitored (**PhD 3**).
- 2) Evaluate the effects of conventional pesticide mixtures on microbiome diversity and structure (**PhD 1**), soil micro- and macroarthropod communities with complementary biological functions (**PhD 2**), as well as soil functions and the accumulation of pesticides in agroecosystems (**PhD 3**).

To apply, submit before November 18, 2022:

- a detailed cover letter
- a transcript
- name and contact details of three references

PhD1 specialized in the soil microbiome

Location: Laval University & AAFC, Saint-Jean-sur-Richelieu

Thiago Gumiere, Ph.D. Thiago.Gumiere@fsaa.ulaval.ca & Jacynthe Masse, Ph.D. jacynthe.masse@agr.gc.ca

PhD2 specialized in soil micro/macro arthropods

Location: UQAM & AAFC, Saint-Jean-sur-Richelieu

Tanya Handa, Ph.D. handa.ira_tanya@uqam.ca & Annie-Ève Gagnon, Ph.D. annie-eve.gagnon@agr.gc.ca

PhD3 specialized in the accumulation of contaminants in the environment

Location: University of Montréal

Frédéric Pitre, Ph.D. frederic.pitre@umontreal.ca & Sébastien Sauvé, Ph.D. sebastien.sauve@umontreal.ca