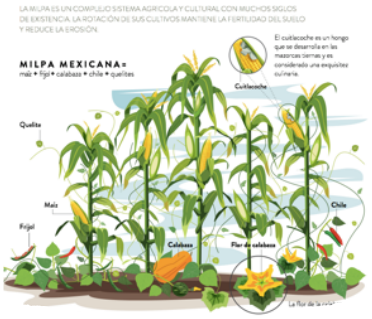
Université de Neuchâtel
Institut de biologie

Master thesis opportunity



Crop Chemical Diversity: Building Blocks of Sustainability and Resilience

Background: Crops have undergone domestication and artificial selection, resulting in diverse breeds with unique traits. This diversity includes varying levels of resistance to pests, diseases, and environmental stresses, making them invaluable resources for climate change resilience. Exploring their chemical traits—such as scent, color, nectar, and pollen—can enhance our understanding of their ecological interactions and potential to support sustainable agriculture.
This project will focus on crops within the Milpa system, a traditional intercropping practice involving maize, beans, and squash. These three crops mutually support each other in unique ways: maize provides a natural structure for beans to climb, beans fix nitrogen in the soil, enhancing fertility for all crops, and squash spreads across the ground, acting as a living mulch to retain moisture and suppress weeds. Milpa is a cornerstone of sustainable agroecosystems, fostering biodiversity, improving soil fertility, and providing stable yields with reduced external inputs. As a time-tested model for sustainable agriculture, milpa highlights the potential of ecological farming systems to address modern challenges such as food security and climate resilience.

Aims: Using a diverse collection of crop breeds from the milpa system, this project aims to analyze the chemical diversity of the species and varieties. The goal is to enhance the ecological and agricultural value of these crops by identifying traits that support ecological interactions and contribute to sustainability and resilience. Controlled greenhouse experiments will systematically characterize chemical traits, including flower scent and color, as well as nutrients from pollen and nectar.

Requested skills: The project will include intensive greenhouse work and phytochemical analyses. We are seeking a highly motivated student with strong interest in chemical diversity and agroecosystem sustainability. Some statistical skills for data analysis with R/Python would be a plus.

Keywords: Sustainable agriculture, chemical diversity, milpa, crops, climate change.

Place of work: UniNe, Institute of Biology.

References:

Benrey, B., Bustos-Segura, C., & Grof-Tisza, P. (2024). The mesoamerican milpa system: Traditional practices, sustainability, biodiversity, and pest control. *Biological Control*, 105637.

Patel, M. K., Pandey, S., Kumar, M., Haque, M. I., Pal, S., & Yadav, N. S. (2021). Plants metabolome study: Emerging tools and techniques. *Plants*, *10*(11), 2409.

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