Université de Lille

Doctoral School for *Materials, Radiation and Environmental Sciences*

Institut régional de recherche Charles Viollette

3-year PhD position in plant biology and phytochemistry (from 01/10/2019 to 30/09/2022)

Chemical and genetic diversity of wild hops from northern France (Hauts-de-France): varietal development and pharmaceutical, agri-food and agricultural assessments

Location: Charles Viollette Institute (EA 7394), University of Lille, Faculty of Pharmacy, Lille (France) (https://institutcharlesviollette.univ-lille.fr/fr_FR/accueil)
Situated in Lille, northern France, the Charles Viollette Institute offers a vibrant interdisciplinary research environment in the field of plant sciences, phytochemistry, agro-food and biotechnology with dedicated facilities.

Background:
Hops have been grown in the Hauts-de-France region since ancient times. Recently, renewed interest in this regional product – particularly typical of French Flanders – has led our team to research its properties for human and plant health (see references below). This project aims to build on this topic while offering prospects for agronomic development that meet the expectations of hop growers and the brewing industry.

Project description:
The initial aim of the project is to carry out phytochemical and genetic mapping of regional hops. This information will be then used for two purposes: to initiate the development of one or more varieties of hops adapted to the local soil of the Hauts-de-France region, in the context of global warming, and to further investigate the pharmacological potential of hop metabolites.
This project will generate in-depth knowledge of the genetics and metabolome of regional wild hops, in order to understand their origin and their possible chemical originality. This chemical characterization could thus discover organoleptic characteristics of interest to breweries, but also have potential pharmaceutical, agri-food and agricultural applications. Hops producing the metabolites of interest (α-acids and essential oils) and the organoleptic characteristics most attractive to the brewing industry can be selected to move towards the development of varietal hops that are adapted to the soil and potentially more resistant to certain pathogens.

Keywords:
Hop (*Humulus lupulus*), chemodiversity, wild hop, genetics, metabolomics, antimicrobial activities, varietal development, co-products, statistical tools, data analysis

Eligibility:
The desired candidate will be a highly motivated student with a master's degree and a strong background in the field of chemistry and genetics. The candidate must have a solid interest in plant sciences, and preferably have already worked on plant models with agronomy concepts. The student will have to master techniques in phytochemistry (extraction, purification, chromatography, mass spectrometry) and in genetics (DNA extraction, PCR, biomarkers). A command of statistical tools and/or experience in metabolomics would be appreciated. The candidate must also have excellent communication skills in written and spoken English and be a good team player who can integrate and interact with different

researchers.

How to apply:
Your application must include your most recent (and relevant) certificate, a short CV (max 3 pages), a motivation letter and the email addresses of your master's supervisor and at least one referee who will write a letter of recommendation.
Please send your application to the supervisor: celine.riviere@univ-lille.fr
Application deadline: 04/06/2019 (Europe/Paris)

This project will be done in partnership with IFBM (Institut Français de la Brasserie et de la Malterie).

References:

Bocquet L., Sahpaz S., Bonneau N., Beaufay C., Mahieux S., Samaillie J., Roumy V., Jacquin J., Bordage S., Hennebelle T., Chai F., Quetin-Leclercq J., Neut C., Rivière C., **2019**. Phenolic compounds from *Humulus lupulus* as natural antimicrobial products: new weapons in the fight against methicillin resistant *Staphylococcus aureus*, *Leishmania mexicana* and *Trypanosoma brucei* strains. *Molecules*, 24(6). pii: E1024.

Bocquet L., Sahpaz S., Hilbert C., Rambaud R., Rivière C., **2018**. *Humulus lupulus* L., a very popular beer ingredient and medicinal plant: overview of its phytochemistry, its bioactivity, and its biotechnology. *Phytochemistry Reviews*, 17, 1047-1090.

Bocquet L., Sahpaz S., Rivière C., **2018**. An overview of the antimicrobial properties of hop. *In* Mérillon J.M. & Rivière C. Natural Antimicrobial Agents, Sustainable Development and Biodiversity, vol. 19, Springer, pp. 31-54.

Bocquet L., Rivière C., Dermont C., Samaillie J., Hilbert J.L., Halama P., Siah A., Sahpaz S., **2018**. Antifungal activity of hop extracts and compounds against the wheat pathogen *Zymoseptoria tritici. Industrial Crops and Products*, 122, 290-297.