

JOB DESCRIPTION

POST DOCTORAL POSITION IN METABOLOMICS BY NMR and MASS SPECTROMETRY

Statutory framework of the position :

- Category : A
- Level : Post-Doc
- Professional activity branch : B
- Type of contract : fixed-term (12 months)
- Full-time

Establishment : Communauté d'Universités et Établissements-Normandie Université

Location : Rouen (Normandy – France) – COBRA Laboratory

Context :

Legume crops are interesting for both the nutritional quality of their seeds and the natural nitrogen fertilization of soils. Their production is affected by pathogens and environmental factors, which can cause yield losses of up to 80%. To develop new control methods, it is thus necessary to better understand plant defense mechanisms. Root exudates are composed of a wide range of compounds including primary and secondary metabolites. They are involved in plant growth and responses to environmental stresses. Indeed, by modulating root exudate composition, plants can modify soil properties to adapt, recruit beneficial microorganisms and ensure their survival under adverse conditions. Although root exudates are important for plant immunity, limited data exist on the metabolite's composition of this highly sophisticated molecular mixture and most of them are still unknown.

Protocols for root exudates collection in view of metabolomics studies by NMR or MS have been recently developed by our group.^{1,2} **The objectives of this project are to develop state-of-the-art methodologies based on Nuclear Magnetic Resonance (NMR) and hyphenated Mass Spectrometry (MS) to enhance metabolites identification and quantification in root exudates.** Indeed, in root exudates, annotation and identification remain difficult due to the presence of a high diversity of metabolites in various concentrations. Cross-comparison of MS and NMR data sets will ensure and facilitate compound annotation and increase annotation levels. Thus, NMR and MS data will be combined to increase the reliability and the identification rate as well as the number of quantified metabolites. These approaches will be applied to three plant species of interest for the Normandy region.

1. Calabrese, V.; Schmitz-Afonso, I.; Riah-Anglet, W.; Pawlak, B.; Afonso, C. Comparison of direct introduction sources coupled with Fourier Transform Ion Cyclotron Mass Spectrometry applied to the analysis of *Pisum Sativum* Root exudates, *Talanta* 2023, 253, 123901. DOI: 10.1016/j.talanta.2022.123901

2. Fortier, M.; Lemyre, J.; Ancelin, E.; Oulyadi, H.; Driouich, A.; Vicré, M.; Follet-Gueye, M.L; Guilhaudis, L. Development of a root exudate collection protocol for metabolomics analysis using Nuclear Magnetic Resonance, *Plant Science* 2023, 331, 111694. DOI: 10.1016/j.plantsci.2023.111694 Key words: metabolomics, NMR, mass spectrometry, root exudates

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Host laboratories & research environment :

The research will take place at the COBRA laboratory (<https://www.lab-cobra.fr/>). The lab is localized in the Mont Saint Aignan University campus (<https://www.univ-rouen.fr/university-ofrouen-normandy/>), in the North west of Rouen (France).

The selected candidate will be recruited by Normandie University and funded by the LabEx SynOrg (~2100 € net/month). He/she will benefit from the state-of-the-art analytical instrumentation park available at the COBRA laboratory for metabolomics studies (Including liquid state NMR spectrometers 600 MHz with and without a cryoprobe; mass spectrometers such as GC-TOF, LC-Q-Orbitrap, LC-IMS-Q-TOF, FTICR-MS).

Candidate profile :

- Applicants should have a PhD in Analytical chemistry (mass spectrometry and/or NMR) Experience in metabolomics will be considered as assets but is not mandatory.
- Applicants must demonstrate ability to publish in peer reviewed reputable journals and give presentations in scientific conferences.
- Rigour, organizational and statistical skills are expected, considering the type and volume of data which will be obtained via the various experimental methods.
- The candidate will have to demonstrate his/her capacity to work on a multidisciplinary research topic.

Application procedure and selection process :

Interested applicants are required to submit the following documents via email to laure.guilhaudis@univ-rouen.fr and isabelle.schmitz@cns.fr **A CV, a motivational letter, a research summary as well as contact detail of 2 references able to provide recommendation letters before august 21st**. Shortlisted applicants will be invited for oral interview (visio possible).

Expected starting date :

During the month of October 2023 (It will probably be possible to start in November or December 2023)

Contract information : fixed term; full-time; ~2100 € net/month

Contacts :

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Ms. Isabelle SCHMITZ, Tel: + 33 2 35 52 29 23, e-mail: isabelle.schmitz@cns.fr

Other references :

Perruchon, O.; Schmitz-Afonso, I.; Grondin, C.; Casaregola, S.; Afonso, C.; Elomri, A. Combination of UHPLC-MS/MS-molecular networking approach and FTICR-MS for the metabolic profiling of *Saccharomyces cerevisiae*. *J Pharm Biomed Anal* 2021, 195, 113857. DOI: 10.1016/j.jpba.2020.113857

Wauquier, F.; Boutin-Wittrant, L.; Viret, A.; Guilhaudis, L.; Oulyadi, H.; Bourafai-Aziez, A.; Charpentier, G.; Cassin, E.; Descamps, S.; Roux, V.; Macian, N.; Pickering, G.; Wittrant, Y. Metabolic and Antinflammatory Protective Properties of Human Enriched Serum Flowing Artichoke Leaf Extract Absorption: Results from an Innovative Ex Vivo Clinical Trial. *Nutrients*. 2021, 13 (8), 2653. DOI: 10.3390/nu13082653

Calabrese, V.; Schmitz-Afonso, I.; Prévost, C.; Afonso, C.; Elomri, A.; Molecular networking and collision cross section prediction for structural isomer and unknown compound identification in plant metabolomics: a case study applied to *Zanthoxylum heitzii* extracts. *Anal. Bioanal. Chem.* 2022. DOI: 10.1007/s00216-022-04059-7

