M2 INTERNSHIP SUBJECT

TITLE : Effects of grapevine rootstock genotypes on root exudation and rhizodeposition, a metabolomic study

CONTEXT:

In response to their environment, plants modify the composition of the soil zone surrounding their roots (also known as the rhizosphere) through the exudation and/or rhizodeposition of molecules. This change in composition can improve plant growth and resistance by modifying the chemical composition of the soil, and by influencing the composition of the soil microbiota. Some of these molecules are capable of attracting beneficial and/or pathogenic soil bacteria and fungi, which then associate with the plant's roots. The molecules produced also take part of the plant defense arsenal, for example through antimicrobial activity. In our team we are studying how vine rootstocks communicate with the rhizosphere microbiota to adapt to their environment.

OBJECTIVES:

The aim of the internship is to analyse the metabolome composition of the different compartments of root system of six grapevine rootstocks. The metabolomic data is available and will be analysed during the internship, through bioinformatics tools.

First, to study the response to nitrogen deficiency, an experiment was carried out in hydroponics (as described in Lailheugue et al., 2023). Samples of roots and root exudates were taken and their metabolomic composition was analysed by LC/MS-MS. The objective is here to identify metabolites differentially regulated between genotypes and putatively involved in the interaction with beneficial microbes.

Second, samples of soil, rhizosphere and roots of the same genotypes grown in the vineyard were harvested. In a previous study, the microbial composition was analysed using metabarcoding and the results showed that the structure of the microbial community differs between the rootstocks (Lailheugue et al., 2024). The metabolomic composition of same samples was then analysed by LC/MS-MS. The objective here is to analyse the metabolic composition of the different compartments and identify compounds that could be correlated to the microbial composition.

METHODS:

The student will develop skills in bioinformatics and metabolomic analysis applied to plant/microorganism interaction. Complementary experiments could be carried out.

PREREQUISITES:

The candidate should be motivated by plant-microorganism interaction and the molecular processes involved. An interest in bioinformatics analyzes (carried out in collaboration with the bioinformaticians of the team) is essential.

KEYWORDS (5) : Grapevine, rootstock, plant-microbe interaction, molecular dialogue, metabolomics.

NAME OF THE SUPERVISOR: Virginie LAUVERGEAT

NAME and ADDRESS OF THE TEAM/LABORATORY: UMR Ecophysiologie et Génomique Fonctionnelle de la Vigne, ISVV, 210 Chemin de Leysotte 33882 Villenave d'Ornon

TEL : 0666491919

E-MAIL : virginie.lauvergeat@inrae.fr