



IPREM
Institut des sciences analytiques
et de physico-chimie
pour l'environnement et les matériaux



Thesis: Pruning methods impact on the grapevine microbiome in the context of the devastating trunk disease, Esca.

Project Description:

Grapevine Trunk Diseases (GTDs) have become in the two last decades a subject of major concern for the wine industry. GTDs have deleterious effects on vineyards; they are associated with a decrease in harvest quantity, they induce poor wine quality and they reduce the lifespan of grapevine in many vine-growing areas. For 2014-2017 alone, the estimated losses are colossal: nearly 12% of French vineyards are unproductive due to GTDs, mainly Esca, causing one billion euros in shortfall. Because Esca is also the most prevalent GTD in Europe, numerous studies have focused on this ancient and ubiquitous disease. Esca disease is considered as the result of the pathogenic activity of several fungal species, notably the basidiomycete species *Fomitiporia mediterranea*, which causes the white-rot necrosis that is specially associated with this disease. Extensive white-rot development is associated with sap-flow disorder several weeks before the onset of Esca-leave symptoms. This leads to plant physiological disturbances and, ultimately, to the grapevine death. A variety of cultural, pruning, and training practices, qualified as beneficial to plant health and production, are being implemented in vineyards to reduce GTDs spreading and development. These practices induce modifications on the microbiome colonizing the wood of grapevines, since such differential grapevine pruning methods (minimal vs spur-pruning) influence the diversity of wood-colonizing fungi and wood-necrosis formation. In a previous project, we showed that the choice and management of training systems, such as pruning methods, could be aggravating factors. For instance, training systems producing short-arm shaped grapevines, with pruning wounds mostly located close to the trunk head, were more often affected by GTDs than longer-arm forms with spaced spurs.

The aim of this PhD project is to identify the key stage when the microbial dynamics changes in the wood tissues (i.e. fungal biodiversity changes in favour of pathogen development), and that early wood degradation occurs and drastic grapevine physiology shifts can be observed (e.g. significant sap-flow drop). To achieve this goal, different techniques can be used such as assessments of microbial functions, molecular biology (amplicon sequencing of bacterial and fungal communities), bioinformatics and biostatistics (notably metagenomics and network analysis).

About the laboratory:

This project will take place at University of Pau and will involve Eléonore Attard, Rémy Guyoneaud and Patrice Rey from the Environmental Microbiology Team from the IPREM Institute at the University of Pau which leads several projects on Grapevine Trunk Disease and biocontrol.

This PhD project is embedded in an ANR Industrial Chair, named the 'WinEsca', with 2 companies:

- Maison Hennessy, from the LVMH group, the world's n°1 brand of Cognac,
- Greencell company, from the GreenTech group, a leader in microbial ecology and industrial fermentation in France, producing microorganisms for plant growth/plant health.
- Academic laboratories in Bordeaux, Reims, Montpellier, Austria, Spain and Switzerland are partners of this 'WinEsca' project.

The PhD student will integrate the team in Pau composed by her/his supervisors, 2 others PhD students, 3 postdocs and 1 technician, all involved in the 'Winesca' project.

Qualifications required:

Master 2 diploma allowing to apply for a PhD.

- Being ranked in the first in the Master 2 is recommended.
- Expected skills and knowledge:
 - o Knowledge about microbial ecology, bioinformatics. Knowledge of plant science will be appreciated.
 - o Ability to work with various disciplines and different types of actors is recommended.
 - o Expression and organizational skills are required.

Application:

The applications must include:

- 1) a cover letter outlining your interest in this project,
- 2) a curriculum vitae with exams results and ranking,
- 3) the contact details of at least two relevant referees who can provide a recommendation letter.

Please send the above as a single pdf file to:

eleonore.attard@univ-pau.fr, remy.guyoneaud@univ-pau.fr, patrice.rey@univ-pau.fr

For more information, feel free to contact Eléonore Attard, Rémy Guyoneaud or Patrice Rey.

Application Deadline: 17/05/2023

Duration: 3 years

Start date: September 2023

Gross annual salary range: 24 528€ / year

Location: Pau, France

About the local context

The University is located in the charming city of Pau in the South West of France. The region offers a unique situation, close to the Pyrenees mountains (1h drive), the Atlantic coast (1h drive) and Spain (1h drive), with numerous flight connections from the airport and train connections in 4h30 to Paris.