

Is leaf spectral reflectance an indicator of symbiotic partnership between trees and mycorrhizal fungi?



Starting date : January 2026

Localisation : INRAE Villenave d'Ornon - UMR ISPA

Duration : 6 months

Experience : Master 2 internship

Key words : Mycorrhizae, Spectral Reflectance



Context and objectives :

The plant-mycorrhizal fungi interaction is one of the most important terrestrial symbioses and most tree species associate with ectomycorrhizal (EM) or arbuscular mycorrhizal fungi (AM) to acquire nutrients, water but also protection against a host of biotic and abiotic stresses (1, 2). While mycorrhizal establishment has been observed to trigger adjustments in both the abundance and composition of different primary and secondary metabolites in plant roots and leaves (3, 4), its impact on leaf spectral reflectance is still poorly investigated. Thus, although different spectral signatures have been observed between AM or EM associated tree species at the leaf and the canopy level (5, 6), it remains difficult to disentangle the direct and indirect factors that may play a role in these spectral signals.

In this context a pot experiment will be carried out to follow variations in leaf spectral reflectance and chemical composition in a few plant species grown with and without mycorrhizal fungi. During this internship the main objectives will be: (i) to identify how leaf spectral reflectance is affected by mycorrhizal colonisation and (ii) to identify how species-specific these leaf spectral signals are.

The student will use a spectro-radiometer to measure the leaf spectral reflectance and different analytical methods to measure general leaf traits. Plant roots will be sampled and stained to estimate the extent of mycorrhizal colonisation. Machine learning methods will be used to detect and link the chemical and spectral variations to the level of mycorrhisation. This internship will enable students to acquire solid skills in laboratory but also in spectral analysis and treatments.



Localisation :

The student will work at the [UMR ISPA](#) (Interaction Sol-Plante-Atmosphère) at the INRAE Nouvelle-Aquitaine center in Villenave d'Ornon (France), under the supervision of Thomas Guzman (Post-doc) and Lisa Wingate (Research director).

The monthly allowance is approximately € 560 / month (regulated trainee rate for 35h / week from January to June 2026). Recommended accommodation: room in a university residence (request to be made to the CROUS) or city accommodation to be sought (Bordeaux Sud, Bègles, Pessac, Talence or Villenave d'Ornon).



Competencies required :

This internship is aimed at students motivated by plant and fungal ecology as well as spectral analysis. There will be a strong laboratory component including leaf spectral / chemical measurements and treatments in addition to mycorrhizal colonisation estimation. A solid understanding of statistical analysis using the R environment will be necessary. Good writing and communication skills in French and English will be a plus.



Recruitment process :

Please send a cover letter and CV to Thomas Guzman and Lisa Wingate by **October 31, 2025**.

Thomas GUZMAN

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Lisa WINGATE

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References :

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