

PhD Project: *Studying the role of MUSASHI-like proteins in cell wall synthesis in Brachypodium and Arabidopsis*

Context and PhD Subject: Lignocellulose is a significant carbon reservoir and a renewable source of material for human activities. It comprises cellulose, hemicelluloses, and lignin, mainly found in the secondary cell wall (SCW) of plant cells. The SCW is essential for sap transport in the xylem, vertical growth of the plant, and resistance against pathogens. The composition of the SCW varies significantly depending on cell type and developmental stage, particularly between dicotyledons and monocotyledons. Minor modifications in the SCW composition can lead to remarkable consequences on its physicochemical properties and, consequently, on plant development. The synthesis of the SCW is transcriptionally controlled by a hierarchical network of transcription factors. Despite the major role of these transcriptional mechanisms in SCW regulation, some studies also support the involvement of post-transcriptional mechanisms. The partners of the MUSAWALL ANR project have recently demonstrated the involvement of a family of RNA-binding proteins (MSILs) in controlling SCW deposition in Arabidopsis (Kairouani et al. 2023). These proteins show functional homology with the animal translational regulator MUSASHI and have been shown to impact SCW synthesis, particularly lignin deposition and the methylation of glucuronic acid in glucuronoxylans in Arabidopsis.

The PhD project aims to understand the impact of MSILs on grass cell walls using *Brachypodium* as a model on one hand, and to investigate in detail the wall phenotype of *msil* mutants in Arabidopsis on the other hand. The project combines advanced techniques in molecular biology, biochemistry, and cellular imaging to provide a comprehensive view of MSIL function in both dicotyledons and monocotyledons. This project will provide the candidate with extensive knowledge of cell wall regulation and structural organization, as well as proficiency in multiple techniques.

Environment: By joining INRAE, the PhD student will benefit from excellent working conditions in the Institute's facilities and equipment. The thesis project will be conducted within the multidisciplinary team "Paroi végétale et Polymères pariétaux" (PVPP) in the INRAE-BIA unit in Nantes, comprising 15 permanent researchers and technicians. INRAE BIA offers access to all necessary equipment and methodologies for the study, particularly those of the BIBS instrumental platform. Additionally, the context will lead the candidate to collaborate with other international and national teams, primarily with those of the project located in Perpignan (LGDP) and Toulouse (LRSV).

Supervisors: Richard Sibout, Mathilde Francin-Allami, Luc Saulnier, Thierry Lagrange

Candidate: We are looking for a highly motivated candidate with knowledge (and preferably experience) in microscopy, molecular biology, and biochemistry methods. The candidate must be autonomous and also possess a strong ability to work within a team.

Duration: 36 months starting from October 2024

Salary: €2200 before tax, approximately €1780 after tax.

Please send a CV and a cover letter before June 20, 2024, to richard.sibout@inrae.fr.

Literature: Kairouani et al. 2023. *Elife*. 2023 Sep 29;12:RP88207. doi: 10.7554/eLife.88207.