

# **DOTTORATO DI RICERCA IN BIOLOGIA CELLULARE E DELLO SVILUPPO**

**42° Cycle**

**Project proposal for a PhD scholarship**

**Linking enzymatic cell wall remodeling to growth: a proteomic and genetic study in plants.**

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Plant cell elongation requires precise remodeling of the cell wall (CW), a dynamic structure that must balance strength and extensibility. While the acid growth theory explains some aspects of elongation, the potential role of regulated polysaccharide hydrolysis during growth remains largely unexplored due to technical limitations in detecting its hypothesized products: specific CW-derived oligosaccharides (CWOs). The apoplast, where wall remodeling occurs, contains a complex mixture of proteins, including glycosyl hydrolases (GHs) that could potentially generate CWOs during active growth. This project aims to identify and characterize CW-remodeling enzymes specifically expressed during etiolated growth, a developmental program characterized by rapid hypocotyl elongation. Using etiolated *Arabidopsis* seedlings as a model system, the apoplastic proteome will be profiled at different stages of hypocotyl elongation to identify GHs potentially involved in CW remodeling. The biological role of candidate enzymes will be validated through reverse genetics, analyzing growth phenotypes and CW composition in knockout mutants. A key objective is to test whether CWOs are released during etiolated growth. Apoplastic fluids from elongating hypocotyls will be collected and analyzed by High-Performance AnionExchange Chromatography (HPAEC-PAD) and, where possible, by MALDI-TOF/TOF mass spectrometry to detect and characterize oligosaccharide fragments. This project will provide the first systematic map of GHs active during etiolated growth and test the long-standing hypothesis that polysaccharide hydrolysis generates specific CWO signals during cell elongation.

## **Pertinent Publications of the proponent (last 5 years)**

Lorrari, Riccardo, and Simone Ferrari. "Host cell wall damage during pathogen infection: mechanisms of perception and role in plant-pathogen interactions." *Plants* 10.2 (2021): 399.

Lorrari, Riccardo, et al. "Cell wall integrity modulates HOOKLESS1 and PHYTOCHROME INTERACTING FACTOR4 expression controlling apical hook formation." *Plant Physiology* 196.2 (2024): 1562-1578.