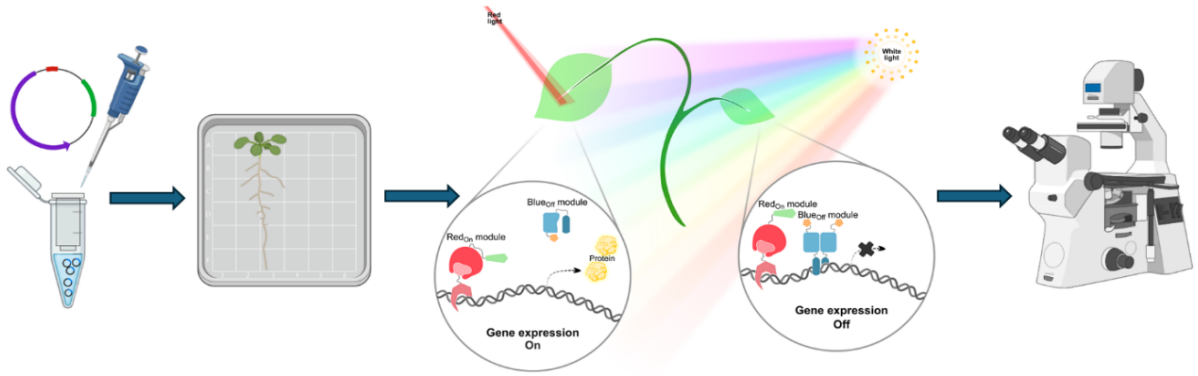
A NOVEL CLONING TECHNIQUE FOR LIGHT-INDUCIBLE ACTIVATION OF GENES IN THE ETHYLENE PATHWAY



Ochoa-Fernandez *et al*. 2020

Crop yield and global food security depend on efficient plant growth and stress adaptation. Ethylene, a key phytohormone, plays a central role in regulating these processes. The ethylene biosynthesis pathway, particularly the production of its precursor 1-aminocyclopropane-1-carboxylic acid (ACC), is tightly regulated by environmental and developmental cues. Understanding and manipulating this regulation is essential to create the next generation of climate-resilient crops.

During your thesis, you will use a novel cloning technique (Golden Gate) to assemble light-inducible genetic modules to drive the expression of ethylene-related genes. By integrating optogenetic modules into plant cells, our objective is to achieve reversible, spatiotemporal regulation of gene expression, allowing us to activate ethylene biosynthesis, anytime and anywhere we want, using the flick of a switch.

The project will integrate molecular cloning, plant transformation, *in vitro* culturing, and advanced live-cell fluorescence microscopy to monitor inducible gene expression and ethylene-related responses. You will receive continuous constructive mentoring and, like in all our projects, you will take active part in ongoing state-of-the-art research.

Combined, your results will provide **novel insights into when, where and how ethylene and its precursor regulate plant growth and development.**

Methods:

- Molecular biology/Golden Gate cloning/transformation of bacteria and plants
- Identification and characterization of new genetically modified plants
- *In vitro* plant culture
- advanced live-cell fluorescence microscopy

References:

Ochoa-Fernandez R, Abel NB, Wieland FG, Schlegel J, Koch LA, Miller JB, Engesser R, Giuriani G, Brandl SM, Timmer J, Weber W, Ott T, Simon R, Zurbriggen MD. Optogenetic control of gene expression in plants in the presence of ambient white light. Nat Methods. 2020, 17(7): 717-725. doi: 10.1038/s41592-020-0868-y.

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