

IRHS
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Object : Master 2 internship 6 months (Jan-Jun 2023)

Title : Influence of seed microbiota on seedling emergence and metabolism

Context and research objectives.

All plants harbor a diverse microbiome colonizing aboveground and belowground plant habitats. These microorganisms can play an important role for plant health and yield in an agricultural context. Still, limited knowledge is available on the role of plant microbiota during the early stages of plant life, especially in germination and emergence. Seeds exhibit diverse microbiota but currently the causal relationships between seed microbiota diversity and seedling emergence have not been established. Gaining a better understanding of the role of this microbiota for seed germination and seedling establishment is particularly timely. The seed industry is preparing for a major revolution in seed treatments associated to the reduction of pesticide usage and harnessing the capabilities of the seed microbiota represents one of the most promising solutions.

In this context, synthetic ecology approaches with the reconstruction of synthetic microbial communities will be used to experimentally establish the causal links and truly quantify the influence of microbiota on seedling emergence and metabolism. More specifically, the objectives of this internship will be to characterize the plant metabolic responses and keystone microbial taxa associated to the effects of seed microbiota.

During this internship, you will perform greenhouse experiments using synthetic microbial communities that have been observed to modulate seedling emergence of common bean (*Phaseolus vulgaris*). To uncover the mechanisms responsible for these effects, you will analyze the response of plant seedlings to the synthetic communities using transcriptomic and metabolomic analyses. The identification of the microorganisms responsible for these effects will be done using metabarcoding and knock-out experiments in which the microorganisms of interest are removed from the synthetic community.

Overall, this project will enable to uncover the role of seed microbiota in emergence success or failure (beneficial or detrimental effects of microbiota) and identify microbial consortia with stimulatory effects for potential phytostimulation or biocontrol applications.

Degree, Skills and technics: Master 1 in Plant Sciences or Ecology or Microbiology

We expect the applicants to have at least two of the skills listed here: Molecular plant physiology (RT-qPCR, GC-MS), Plant phenotyping, Community ecology, Bioinformatics, Microbiology.

Team: This multi-disciplinary project is performed between two research teams in the IRHS unit that possess complementary expertise related to seed microbiota (EmerSys team) and seedling physiology (SMS team). This internship will be conducted in the frame of the PPR-CPA SUCSEED project.

Application: Send a CV, recommendation letter and Master 1 results to marie.simonin@inrae.fr before September 30