RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

INRAE

Thesis
2021-2024

Study of the transmission of seed microbiota and its impact on the phenotype of young plants

Doctoral candidate
Gontran ARNAULT

Doctoral adviser
Marie SIMONIN,
Matthieu BARRET

Funding
50% INRAE / 50%
Région Pays-de-la-Loire

Despite the central role of seeds for food production and maintenance of plant biodiversity, studies on seed microbiota are still few and far between. As a result, knowledge is still limited on the role of this microbiota during the early stages of plant life, in particular during germination and emergence. Seeds have a diverse microbiota but causal relationships between the composition of the seed microbiota and the phenotype of the young plant have not been established. Obtaining a better understanding of the dynamics and influence of this microbiota during crop establishment is particularly timely as the seed industry prepares for a major revolution in seed treatments associated with the reduction in the use of synthetic pesticides.

In this context, this thesis project proposes to use synthetic ecology approaches that allow the study of the dynamics of a microbiota of known composition (synthetic community) and its impact on the host phenotype in a controlled manner. In particular, the first part of this thesis project will focus on the study of the transmission of the microbiota from the seeds to the seedling, in order to determine which fraction actually constitutes the "primary inoculum" of the plant.

In a second part, the effect of this microbiota on different plant traits will be evaluated via high-throughput phenotyping by digital imaging, and characterisation of the seedling metabolome. The last part of this work will consist of identifying the strains/consortia and microbial functions involved in the modification of the seedling phenotype via targeted reconstructions of synthetic communities and by comparative genomics.

Contact
holoflux@inrae.fr