

PROPOSITION SUJET de MASTER 2017-2018

TITRE : Quantification of a wild-type/arbuscular mycorrhizal fungi deficient-mutant plant system for use in soil microbial community experiments

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Nom du candidat éventuellement proposé :

S'il n'est pas retenu, acceptez-vous un autre candidat ?

Oui - Non

Sujet (objectif, démarche et technique, collaboration(s),...):

Microcosms containing field soil, and often with the inclusion of plants, under field or more often controlled conditions, are commonly used to investigate various research questions pertaining to soil microbial communities, and findings are implemented for making predictions about natural ecosystems. Soil microcosm studies have significantly contributed towards our current understanding of the functioning of soil microbial communities. But despite their practicality, microcosms often have some inherent biological limitations due to their design, which can cause compounding experimental effects. It is often desirable to alter the presence or absence of specific microbes or microbial groups, such as arbuscular mycorrhizal fungi (AMF), in the soil to assess their activity and relative contribution on experimental metrics. For example, soil sterilization and fungicide application are often used to rid soils of all or part of their microbial community. However, it is recognized that soil sterilization and fungicide application can have detrimental effects on soil physio-chemical properties. Also, the re-establishment of the indigenous soil microbial community or of select microbes, post-removal, may be difficult and time consuming, as some microbes' replication rates are slow. To circumvent these issues, innovative solutions are required.

An approach that could allow comparison between AMF and non-AMF systems without the complications caused from the process of soil sterilization or fungicide application and re-inoculation of microbes is using a wild-type (WT)/AMF deficient-mutant plant system. This approach consists of a genetic plant pair in which the wild type forms AMF associations and the mutant plant does not. However, before use, experiments are required to verify that the WT and AMF deficient-mutant plants are comparable in both plant growth characteristics and the associated microbial community within the chosen experimental soils.

The aim of this research project is to assess the suitability of the Tomato BC1/WT pair in experimental soils for application in soil microbial community experiments. For this research, plant growth (e.g. biomass), percent colonization of AMF on the roots (through fungal staining and microscopy quantification) and the diversity of the soil microbial community (via Illumina MiSeq sequencing) will be assessed across the plants life cycle. Plant systems will be grown in the greenhouse at the Université de Lyon, and the microscopy and molecular work will be conducted at the Laboratoire Ampère, Ecole Centrale de Lyon, within the Environmental Microbial Genomics Group.

Relevant Publication: Rillig M, Ramsey P, Gannon J, Mummey D, Gadkar V, Kapulnik Y. 2008. Suitability of mycorrhiza-defective mutant/wildtype plant pairs. (*Solanum lycopersicum* L. cv. Micro-Tom) to address questions in mycorrhizal soil ecology. *Plant and Soil* 308: 267–275.