Biotic connectivity of plants shaping microbial assemblages: revisiting plant-microorganisms interactions

Cendrine Mony*[1], Valentin Gaudu[1], Fadwa Khalfallah[2], Romain Causse-Vedrines[1], and Philippe Vandenkoornhuyse[1]

[1]Ecosystèmes, biodiversité, évolution [Rennes] – Université de Rennes, Institut Ecologie et Environnement - CNRS Ecologie et Environnement, Centre National de la Recherche Scientifique, Observatoire des Sciences de l'Univers de Rennes – France

[2]INRAE – INRAE Biogéochimie des écosystèmes forestiers – France

Résumé

Connectivity has been considered as a main concept for understanding assemblages of dispersal-limited organisms. Despite a high interest of landscape ecologists in analyzing the application of this concept to macroorganisms, its effect on microorganisms has been overlooked. Symbiotic fungi, which are associated with plants, and forming their microbiota, display a high spatial heterogeneity, as a response to environmental and dispersal filters. They are generally associated preferentially with certain host plant species, and disperse from plant to plant through hyphae or root contacts, therefore propagating over short-distances. Spatial arrangement of plants conditions hence the probability of contacts among different neighbor species and is likely to influence fungi dispersal.

We present here how adapting the connectivity concept and related hypothesis to symbiotic fungi and introduce the concept of biotic connectivity applied at small spatial scale. Then, we report two experiments set up in controlled conditions, which analyzed the effect of corridor presence and corridor type on fungi assemblages associated with plant roots. We used a simplified experimental design with linearly aggregated plants connecting two patches of a focal plant (corridor treatment), otherwise disconnected (control treatment). In the first experiment using T. repens, we demonstrated that biotic corridors promoted fungal dispersal from one patch to another, and shaped the composition, richness and dynamic of fungal assemblage associated with focal plants. In the second experiment testing M. truncatula patches connected with 4 different treatments of corridor plants, we demonstrated that corridor effect on fungal composition was dependent on plant identity composing the corridor. The permeability of the corridor to fungal dispersal among the connected patches depended on plant species with either barrier or facilitative effects.

The present work suggests that plant communities can constitute biotic landscapes for microorganisms. Their composition and configuration may affect fungi dispersal among plants. Because symbiotic fungi are the basis of many functions to the plants, manipulating plant spatial arrangement could be a perspective to preserve fungi biodiversity.

Mots-Clés: Microbial dispersal, Endophytes, Plant, microorganisms interactions, Landscape ecology

*Intervenant