Variations of soil microbial diversity and communities' assembly history : what matters for ecosystem functioning ?

Kadiya del Carmen Calderon Alvarado, Aymé Spor, Marie-Christine Breuil, David Bru, Florian Bizouard, Romain Barnard, Laurent L. Philippot

THE FIRST GLOBAL
SOIL BIODIVERSITY CONFERENCE
Assessing soil biodiversity and role in ecosystem services

GLOBAL SOIL BIODIVERSITY INITATIVE
Palais des Congrès, Dijon, France
2-5 DECEMBER 2014

THE FIRST GLOBAL
SOIL BIODIVERSITY
CONFERENCE

December 2-5, 2014, Dijon, France

Book of Abstracts

© Crédit photo Mairie de Dijon "

PROGRAM AND ABSTRACTS

THE FIRST GLOBAL

SOIL BIODIVERSITY CONFERENCE

GLOBAL SOIL BIODIVERSITY INITIATIVE

December 2-5, 2014

Dijon – France

[P1.082]

Variations of soil microbial diversity and communities' assembly history: what matters for ecosystem functioning?

K. Calderón*, A. Spor, M.C. Breuil, D. Bru, F. Bizouard, R. Barnard, L. Philippot

INRA, France

Microbial communities have a central role in ecosystem processes by driving the Earth's biogeochemical cycles. However, the importance of microbial diversity for ecosystem functioning is still challenged, notably because of the "functional redundancy". We recently showed that a reduction in denitrifier diversity resulted in a significant decrease in potential denitrification activity. However, our comprehension of the rules governing the assembly of bacterial populations and determining their structure is limited. In this study, we aimed at understanding how communities of different levels of diversity assemble when colonizing a sterile soil, how invasions with exogenous populations impact their structure and composition, and if these changes in population structure and diversity are causing changes in N-cycle activities.

Therefore, we experimentally manipulated the soil microbial community structure and the history of communities' assembly. We separately inoculated sterile soil microcosms with two different microbial communities extracted from native soils (Epoisses in France and Ullerâker in Sweden) at four different dilution levels in triplicate. After 44 days of colonization, flasks were reinoculated with one or the other community at two different dilution levels in triplicate mimicking an invasion process, while control microcosms for each soil and at each dilution were either sampled after 44 days or kept unchanged until the end of the experiment. The invaded and the control microcosms were finally sampled after 105 days.

For each microcosm, the abundance of different N-cycle microbial guilds was measured by qPCR and total bacterial diversity was determined by *16S rRNA* gene amplicons sequencing. NH_4^+, NO_3^- pools, and total mineral N content were quantified as a proxy for global N-cycle activities.

Our results revealed that the dilution/colonization experiment impacted drastically the structure and the activity of the soil microbial communities with either nitrification or denitrification favoured depending on the initial dilution. Invasions of established populations with a 2^{nd} one had various effects on microbial community structure and activities depending on the origin of the established populations and the level of diversity of the invading ones. Altogether, our work suggests that changes in microbial community diversity resulting from erosions of diversity and/or invasions of exogenous populations can have dramatic consequences on N-cycle functioning in soils.

Keywords: Functional redundancy, microbial community structure, assembly, N-cycle