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Research Article

RESEARCH ARTICLE

Bacterial succession on decomposing leaf litter exhibits a specific occurrence pattern of cellulolytic taxa and potential decomposers of fungal mycelia

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One sentence summary: Bacterial community associated with decomposing leaf litter: description of its composition, function and relationship with other microorganisms.

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ABSTRACT

The decomposition of dead plant biomass contributes to the carbon cycle and is one of the key processes in temperate forests. While fungi in litter decomposition drive the chemical changes occurring in litter, the bacterial community appears to be important as well, especially later in the decomposition process when its abundance increases. In this paper, we describe the bacterial community composition in live *Quercus petraea* leaves and during the subsequent two years of litter decomposition. Members of the classes *Alpha-*, *Beta-* and *Gammaproteobacteria* and the phyla *Actinobacteria*, *Bacteroidetes* and *Acidobacteria* were dominant throughout the experiment. Bacteria present in the oak phyllosphere were rapidly replaced by other taxa after leaf senescence. There were dynamic successive changes in community composition, in which the early-stage (months 2–4), mid-stage (months 6–8) and late-stage (months 10–24) decomposer communities could be distinguished, and the diversity increased with time. Bacteria associated with dead fungal mycelium were important during initial decomposition, with sequence relative abundances of up to 40% of the total bacterial community in months 2 and 4 when the highest fungal biomass was observed. Cellulose-decomposing bacteria were less frequent, with abundance ranging from 4% to 15%. The bacterial community dynamics reflects changes in the availability of possible resources either of the plant or microbial origin.

Keywords: bacteria; leaf litter; decomposition; cellulose; succession; fungal mycelia

INTRODUCTION

Temperate forests cover an area of 5.7 million km^2 worldwide (Lindquist *et al.* 2012), and a large part of this biome are deciduous forests. The amount of leaf litter produced annually by deciduous trees is estimated to range in tons per hectare (Bray and Gorham 1964). Although both fungi and bacteria have the capacity to decompose litter components (Štursová *et al.* 2012), the traditional view has emphasized the role of fungi in the decomposition of plant biomass due to their adaptations, including filamentous growth, the ability to translocate nutrients and the possession of an efficient enzymatic apparatus (de Boer *et al.* 2005; Eichlerová *et al.* 2015). Although some studies tend to confirm the dominance of fungi in litter decomposition *in situ* (Schneider *et al.* 2012), others indicate that the role of bacteria in the decay of dead plant biomass is also important (López-Mondéjar *et al.* 2016a,b). Despite these findings, the dynamics of the bacterial

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