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15N-DNA-Based Stable Isotope Probing a Suitable Tool to Link Microbial Activity with Identity in Plant Residue Decomposition Process

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Abstract

DNA-based stable isotope probing (DNA-SIP) is a cultivation independent technique that involves exposing of microbial community to an isotopically labelled substrate; the labelled DNA (biomarker molecule) is an indicator that the community was active in the assimilation of the substrate. This approach allows direct observations of substrate assimilation in microbial communities and represents an interesting new tool for linking microbial identity and function of specific organism or group of organisms. To link activity and microbial identity of communities involved in plant residue decomposition process, an incubation experiment was conduced with highly ^{15}N-enriched plant residues (90 atom %) incorporated (1 %) in a Vertisol soil, taken from a long-term field experiment carried out in Venezuela since 1997. The crop residues were incubated for 30 days (25°C) at 40 % WHC. A control without residue was also used. Microbial activities parameters (e.g. ergosterol content, enzymes activities) were determined after 3, 7, 15 and 30 days. DNA was extracted from soil samples and the active microbial community was analysed by using ^{15}N-DNA stable isotope probing (^{15}N-DNA-SIP) and molecular (PCR-DGGE, cloning and sequencing) techniques; Sequences information was compared with known sequences deposited in the National Center for Biotechnology Information (NCBI) data bank using BLAST and phylogenetic analysis was done using parsimony (PAUP software). Linking microbial activity parameters with ^{15}N-DNA stable isotope probing technique revealed the predominant role of the fungal community (e.g. *Mortierella*, *Fusarium* and *Chaetomium*) as early plant residue decomposers contrary to the common bacterial dominance in the initial degradation of easily decomposable products

Keywords: ^{15}N-DNA SIP, microbial activity, microbial community, stable isotope

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