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Assessing the Effect of Management Practices on Soil Microbial Communities in a Vertisol Using Enzyme and ^{15}N-DNA Stable Isotopic Probing Techniques

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Abstract

Land use and agricultural management have been shown to cause significant effects on microbial activity, population structure, and on their functions. Recently the approaches for studying soil microbiota have moved from biochemical and microbiological determinations such as enzyme activities, microbial biomass and respiration coefficients towards the investigation of microbial community structures. The effect of different management practices (tillage, residues and cropping systems), on soil enzymes activities and organic carbon content were evaluated in a long-term experiment in a Vertisol conduced at Aragua state in Venezuela since 1997. The most important results from 6 years of evaluation of the biochemical and biological properties showed a contrasting behaviour between tillage systems. Conventional tillage (CT), presented not only higher enzymes activities, but also reduced organic carbon accumulation in the topsoil (0–5 cm). The dehydrogenase activity was higher in CT. The soil enzymatic activities related to N mineralisation such as urease and protease were concentrated in 0–10 cm and were lower in no tillage (NT). The amount of N released from crop residues was higher in CT, indicating a faster decomposition rate of residues due to higher soil biological activity. There was also a lower soil biological activity in the maize-soybean crop rotation system compared to monocrop maize. To identify the active microbial community involved in crop residues decomposition of different quality an incubation experiment is being conduced with ^{15}N-enriched residues using the stable isotopic probing (SIP) technique. We have shown the potential of the ^{15}N-DNA SIP using both pure culture and soil samples when DNA was labelled with > 40 atom%^{15}N enrichment.

Keywords: ^{15}N-SIP, enzymes activity, management practices, microbial community

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