P303-WE

MIGRATION OF NATURAL AND ANTHROPIC ORGANIC MOLECULES AFTER AMENDMENTS WITH A BIO-URBAN WASTE COMPOST ON A FRENCH LOAMY SOIL

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Soils play a central role in the biogeochemical cycling of carbon (Amundson, 2001; Wang and Hsieh, 2002), but only partly understood. Sudden change in the global carbon cycle raises the question of carbon storage in soils (Houghton, 1995). The carbon sequestration potential of any soil depends on its capacity to store resistant plant components in the medium term and to protect and accumulate humic substances. Thus, the sequestration potential depends on the chemical characteristics of the soil organic matter and its ability to resist to microbial decomposition.

To prevent erosion and desertification, amendments of organic wastes are evaluated. Different amendments such as compost, sewage sludge, ovine manure or humic acids solutions have been studied (Albiach *et* al., 2001). The pathways of transformation of these organic substances at the molecular level are however still far from being understood. Most of the studies performed on soil organic matter concern humic and fulvic acids and, to a lesser extent, humin. Whereas lipids have only been extensively studied in sediments.

The purpose of this work consists in studying the evolution, in an amended soil, of bio-urban waste compost components and the modifications induced on endogen organic matter. The final aim is to propose indicators to reliably estimate the Carbon sequestration of a soil.

The reference soil of a carefully maintained long-term experiment is located on the Deffend ORE field (University of Poitiers), Mignaloux-Beauvoir (Poitiers), France. It's a loamy soil with a low structural stability. After an intensive cultivation period, the field has been under pasture since ten years. The organic amendment is a bio urban waste compost (composting plant of La villedieu du Clain, France). It has been characterized at the molecular level (M. P. SOM, 2006, thesis).

Three different quantities of compost were added on the soil; 50, 100 and 150 t/ha. The reference soil and the three amended soils were sampled after 3 days, 7 months, 1 and 2 years.

Bulk characterization of soil and amended soil was achieved by Thermogravimetry and Differential Scanning Calorimetry (ATD-ATG), X-ray Diffraction (XRD), Infra Red spectroscopy (IRFT) and elemental analyses. Three subfractions (clay, silt and sand fractions) were extracted from each sample. These granulometric fractions were characterized, as bulk sample, by global analysis and by thermochemiolysis (TMAH/Py-GCMS).

Lipid, “fulvic acid”, “humic acid” and “humin” fractions were obtained following the IHSS procedure for both reference and amended soils. Lipids were analysed by Gas Chromatography coupled to Mass Spectrometry (GCMS) and Humic substances were characterized by thermochemiolysis.

Major components obtained by thermochemiolysis of humic substances are of vegetal and bacterial origin (lignin monomers and fatty acid methyl esters).

Principal components of lipids are of both bacterial and vegetal origin. Long-chained hydrocarbons, with an odd-carbon number predominance, long-chained fatty acids, dominated by even-carbon number and triterpenic compounds (α- and β-amyrine…) are identified. So do ramified fatty acids (C_{15} and C_{17} iso, ante-iso) and hopanoid compounds wich are markers of bacteria presence. During amendment experimentation, emphasize will be made on specific polycyclic molecules (diterpenoïc compounds) found in the green compost.

First results confirm that incorporation of the labil pool (lipids) starts in the fine fraction (< 2µm) and is followed by degradation process. Fractions dominated by clays show lignin monomers. We can expect that these molecules are protected by clays.

Those results could bring a better understanding of the dynamics of organic matter, in general, and the rate of incorporation and its location, in particular, in various pools.

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