



## **Assessment of compost organic matter changes upon composting, a pyrolysis-GC/MS study combining various chromatographic conditions**

**M.-F. Dignac** (1), S. Houot (2), M. Poitrenaud (3) and S. Derenne (4)

(1) Laboratoire de Biogéochimie des Milieux Continentaux, INRA-CNRS- Paris VI, Bât EGER, 78850 Thiverval-Grignon, France (dignac@grignon.inra.fr)

(2) Environnement et Grandes Cultures, INRA INAP-G, 78850 Thiverval-Grignon, France

(3) CREED, Zone portuaire de Limay, 291, Avenue Dreyfous Ducas, 78520 Limay, France

(4) Laboratoire de Chimie Bioorganique et Organique Physique, UMR CNRS 7573 ENSCP, 75231 Paris Cedex 05, France

Characterizing the chemical composition of compost organic matter (OM) may help to understand short- and long-term effects of compost spreading on soils. Pyrolysis coupled to gas chromatography (GC) and mass spectrometry (MS) is a powerful tool to characterize compost OM. However, due to the complexity of compost pyrolysates, the chromatographic conditions used to separate pyrolysis products must be cautiously chosen to avoid preferential detection of certain classes of organic compounds against others.

In this study we combined the complementary information gained on two chromatographic columns (a non-polar and a polar one) to evaluate changes of compost OM between three and six months of composting. Green waste, sewage sludge, biowaste and municipal solid waste composts collected on industrial composting plants in France were studied.

The compost pyrolysates obtained on the non-polar column were dominated by alkanes and alkenes ranging from C<sub>10</sub> to C<sub>33</sub>. Since the most recalcitrant constituents of soil OM are known to mainly contain aliphatic structures, characterizing the aliphatic part of compost OM and its changes upon composting may be useful to evaluate the potential of compost use for long-term carbon storage in soils. Large differences

were observed, regarding alkane and alkene distribution, according to the composted wastes. No substantial changes of alkane and alkene distributions were observed between three and six months of composting of green wastes. By contrast, the longer chain alkanes possibly originating from plant waxes were decreased upon composting of sewage sludge (co-composted with green wastes) and municipal solid wastes where green wastes represented 17% of the initial composted wastes.

Compost OM stability is mainly related to the presence of biodegradable compounds, such as proteins, polysaccharides and lipids which pyrolysis products were better separated on the polar column. The distribution of polysaccharide-derived and N-containing products in green waste and biowaste compost pyrolysates did not change significantly between three and six months of composting, confirming that these composts were stabilized after three months as shown by their low biodegradability in soils.

In the pyrograms of the sewage sludge and municipal solid waste composts after three months of composting, ubiquitous fatty acids from C<sub>14</sub> to C<sub>18</sub> were observed with the polar column. After six months of composting, these acids were largely decreased. A special attention must be paid to these compounds because lipids are hydrophobic constituents known to promote the resistance of soil aggregates against water hence to have a positive effect on soil physical stability when the compost is spread on soils.

Combining the pyrolysis information obtained with non-polar and polar chromatographic columns appeared essential in this study to accurately describe compost OM, and evaluate some compost properties which should be interesting for the management of composting process and compost use in agriculture.