P32

STRUCTURAL ALTERATIONS OF SOLUBLE AND COLLOIDAL HUMIC-LIKE FRACTIONS DURING INCUBATION OF ^{15}N LABELLED SOIL-COMPOST MIXTURE

F.J. González-Vila*, G. Almendros, P. Tinoco**, J. Rodríguez***

* Instituto de Recursos Naturales y Agrobiología, CSIC, P.O. Box 1052, 41080-Sevilla, Spain
** Centro de Ciencias Medioambientales, CSIC, Serrano 115B, 28006-Madrid, Spain

A ^{15}N-labelled compost was prepared during 80-day laboratory incubation of a mixture of urban waste, wheat straw and $K^{15}NO_3$. Curie-point pyrolysis and analysis of stable isotope ratios were used to monitor the changes during composting in the qualitative and quantitative speciation patterns of the N compounds in the different compost fractions i.e., water-soluble fraction, colloidal fractions (humic acid-like and fulvic acid-like), and particulate organic fractions. This compost was added to a mineral soil and subjected to further incubation for 80 days. After the incubation, up to 15% of total soil N corresponds to ^{15}N-compounds. The stable isotope ratios ($^{14}N/^{15}N$) of the labelled compost fractions (incorporating 21.4% N as ^{15}N) and soil fractions were compared to monitor the distribution of the N compounds in the different soil organo-mineral compartments. Finally, a preliminary identification of the molecular composition of the major C and N forms in soil and compost fractions was carried out by Curie-point pyrolysis.

It was found that most of the newly-formed N-compounds tend to concentrate in the water-soluble (> 95% ^{15}N richness) and in the alkali-insoluble, particulate residue (>25% ^{15}N richness) but about 28% of the N remains in colloidal, humic-like fractions. The fulvic acid-like fraction released upon pyrolysis typical anhydrosugar and furan compounds suggesting that the most soluble compost fractions originate mainly from carbohydrate material. The ^{15}N in this soil fraction amounts to 0.7 % total N (up to 9 % of the N from the nitrate added). The humic acid fraction (1.4 % of the total N) released typical methoxyphenols and some nitrogen-containing compounds, pointing to the presence of a microbially-reworked lignin with a substantial peptidic domain. The particulate fractions yielded significant amounts of alkyl molecules suggesting a moiety of recalcitrant, insoluble, lipid polymer material. The water soluble fraction showed the most heterogeneous composition yielding upon pyrolysis a series of methoxyphenols and carbohydrate-derived products in addition to significant yields of fatty acids. It showed the greatest yields of N-containing pyrolysis compounds (mainly pyrroles) and accounts for 1.7 % of the total N, with up to 96 % as ^{15}N, which suggest that most of the N added are in soluble reactive forms.

Keywords: ^{15}N-labelling of compost, $^{15}N/^{14}N$ ratios, incubation experiments, flash pyrolysis, humic fractions, water-soluble material.