Geophysical Research Abstracts
Vol. 18, EGU2016-632-1, 2016
EGU General Assembly 2016

Biochemical stability of sewage sludge chars and their impact on soil organic matter of a Mediterranean Cambisol

Marina Paneque (1), José María De la Rosa (1), Carlos Aragón (2), Jürgen Kern (3), and Heike Knicker (1)

(1) Instituto de Recursos Naturales y Agrobiología (CSIC), Seville, Spain, (2) Centro de las Nuevas Tecnologías del Agua (CENTA), Carrión de los Céspedes, Seville, Spain, (3) Leibniz-Institut für Agrartechnik Potsdam-Bornim e.V., Potsdam, Germany

Transformation of sewage sludge (SS) into char achieves sludge hygienisation, which is necessary prior its application into agricultural soils. The pyrolysis of SS increases its stability in a degree which depends on the thermal treatment used. Thus, chars produced by using hydrothermal carbonization are typically more stable than normal soil organic matter (SOM), but less stable than chars from dry pyrolysis (Libra et al., 2011). Addition of highly-recalcitrant SS-chars to soil will likely increase its carbon sequestration potential; however the fertilizing properties of SS may be compromised due to its alteration during the pyrolysis.

The main goal of this work was to investigate the biochemical recalcitrance of two ^{13}C-enriched SS-chars once applied in a Mediterranean Cambisol as well as to evaluate their impact on the SOM quality and carbon stability.

Thus, we studied the distribution of ^{13}C between plants and soil after the addition of the ^{13}C-enriched chars (2 atm%) to the soil. Therefore, we performed a greenhouse incubation experiment, using a Mediterranean Cambisol as matrix and tested the following treatments: control (soil alone), raw SS, SS-hydrochar, SS-pyrochar. The SS was produced in a pilot-scale waste-water plant and enriched with ^{13}C by the addition of ^{13}C-glucose during the treatment. The amendment was only applied to the upper 2 cm of the soil matrix where it accounted for 5% of its dry weight. Per pot, 25 seeds of *Lolium perenne* were sowed and incubated under controlled conditions. The biomass production as well as the concentration of ^{13}C in leaves and roots was determined after 1, 2 and 5 months. The partitioning of the ^{13}C between soil and plant and its transformation into bioavailable forms were monitored by stable isotopic mass spectrometry. The ^{13}C-enrichment of the chars allowed the use of solid-state ^{13}C NMR spectroscopy as a means for the detection of chemical alterations of the chars during their aging.

Libra J., Ro K., Kammann C., Funke A., Berge N., Neubauer Y., Titirici M., Fuhner C., Bens O., Kern J., Emmerich K. (2011) Hydrothermal carbonization of biomass residuals: a comparative review of the chemistry, processes and applications of wet and dry pyrolysis. Biofuels, 2 (1), 89-124.