EGU22-11554
https://doi.org/10.5194/egusphere-egu22-11554
EGU General Assembly 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Differences of antibiotic-adsorption properties on various soil organic carbon pools

Anna Viktória Vancsik[1,3], Lili Szabó[1], Zsolt Pirger[2], László Bauer[1,3], Gergely Jakab[1,3,4], Attila Csaba Kondor[1], and Zoltán Szalai[1,3]

[1]Geographical Institute, Research Centre for Astronomy and Earth Sciences, Budaörsi út 45, Budapest H-1112, Hungary
[2]Balaton Limnological Research Institute, Eötvös Loránd Research Network, Klebelsberg Kuno u. 3, Tihany H-8237, Hungary
[3]Department of Environmental and Landscape Geography, Eötvös Loránd University, Pázmány Péter sétány 1/C, Budapest H-1117, Hungary
[4]Institute of Geography and Geoinformatics, University of Miskolc, Egyetemváros, Miskolc H-3515, Hungar

The ever-increasing use of pharmaceuticals in the 21st century has led to growing concern about the environmental impact of pharmaceutical substances. In terms of their mechanism of action, antibiotics pose one of the most significant risks to the environment by altering microbiological conditions. Microbial degradation of organic matter in soil systems is the primary driver of the carbon cycle, so antibiotic pollution can significantly impact soil CO2 emissions. Soil organic matter is not a homogenous system; most soil organic carbon models separate different carbon pools with shorter and longer decomposition times. As previously published, different soil organic carbon pools may have different chemical properties, and therefore adsorption properties. This study focused on the adsorption properties of different soil carbon fractions.

Adsorption studies were performed on three fluoroquinolone antibiotics (ciprofloxacin, norfloxacin, ofloxacin) by batch and kinetic experiments on three Luvisol samples with different land use (arable, grassland, forest). The SOM fractionation was based on the Zimmermann procedure, and the batch and kinetic experiments have also been carried out on the fractions. The soil fractions were analysed by TOC, XRD, XRF, BET, FTIR during the adsorption. Langmuir and Freundlich models were applied on the equilibrium data. The kinetics data were analysed by pseudo-first and second-order kinetics models. The main parameters affecting adsorption were studied by principal component analysis. Our results suggest that the long-term carbon pools are most affected by the adsorption of antibiotics.

PREPARED WITH THE PROFESSIONAL SUPPORT OF THE DOCTORAL STUDENT SCHOLARSHIP PROGRAM OF THE CO-OPERATIVE DOCTORAL PROGRAM OF THE MINISTRY OF INNOVATION AND TECHNOLOGY FINANCED FROM THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION FUND.