EGU24-3604, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-3604
EGU General Assembly 2024

Transport of Biodegradable Nanoplastics Affected by Weathering and Proteins in Unsaturated Porous Media

Yingxue Yu[1] and Markus Flury[2]
[1]Connecticut Agricultural Experiment Station, Department of Environmental Science and Forestry, New Haven, United States of America (yingxue.yu@ct.gov)
[2]Department of Crop & Soil Sciences, Washington State University, Pullman and Puyallup, United States of America (flury@wsu.edu)

The increasing threat from plastic pollution has promoted the widespread application of biodegradable plastic. In agriculture, biodegradable plastic, mainly in the form of biodegradable plastic mulch, has received a lot of attention due to its in-situ degradability and satisfying agronomical performances. However, biodegradable plastic mulches do not degrade instantaneously but rather fragment into micro- and nanoplastics, and these micro- and nanoplastics could reside in soil or even migrate along soil profiles. Here, we investigated the mobility of pristine and weathered polybutylene adipate co-terephthalate (PBAT) nanoplastics in sand columns under unsaturated flow conditions. We further studied the effect of proteins on the mobility of PBAT nanoplastics with both negatively charged bovine serum albumin and positively charged lysozyme. We found that (1) the pristine and the weathered PBAT nanoplastics were mobile with or without the presence of proteins; (2) the positively charged lysozyme inhibited the transport of PBAT nanoplastics; and (3) lower water saturation inhibited the transport of PBAT nanoplastics via physical straining. These results suggest that biodegradable nanoplastics generated from biodegradable plastic mulches are mobile and may transport readily along soil profiles.