The importance of microplastics in sewage

Microplastics (MP) are small plastic pieces that are 1–5,000 μm. Water treatment plants (WWTPs) remove microplastics from water, where they eventually get concentrated in sewage sludge. The sludge is then spread in agricultural soils that are used for crop production. While sewage sludge can supply nutrients, it could also introduce potentially toxic elements. Microplastics in soil could induce changes in soil fertility, thereby creating a potential threat to plant performance and crop productivity.

Research Objectives
➢ Investigate the relationship between soil nutrients concentration with sludge treatment to understand the impact coming from microplastics addition

Research Aims
• What are the levels of different soil nutrients (Mo, Cu, Ni, Zn, Cr, Se) in soil samples with and without microplastics?
• What is the distribution of microplastics in studied area?

Conclusion
➢ Sewage sludge as a fertilizer can provide nutrients necessary for crops. However it is the biggest contributor to soil microplastics
➢ Microplastics from sludge accumulate over time after each application despite the nutrient is being taken up by crops.
➢ Microplastics can affect geochemical cycling of elements (such as C, N, and P) in soil.
➢ Furthermore, there is still need to research on other soil nutrients in relation to microplastics

Microplastics in sewage sludge

Average concentration of microplastics in biosolids from UK wastewater treatment plants (mg/kg (DW))

- Horton et al., (2017): 37
- Lee et al. (2021): 10.6

The export of MP from sludge to land in UK
• can be in the region of 2.25 x 10^12 MP/d, around 1.000.000 MP/kg sludge, 9.6 g/kg (UKWIR 2022)
• 1.61 x 10^10 of microplastics end up in the biosolids every month from one waste water treatment work in England (Harley-Nyang et al., 2022)

Accumulation of microplastics in soils
• increase in microplastic content was observed with each successive sludge application (van den Berg et al., 2020)

Preliminary Results
• Dataset: sludge application and nutrient concentration

Study area farmlands with different history of sludge application in central UK, soil type, agricultural practices and crop controlled

References