
Fate of microplastics applied to agricultural soils in biosolids

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Abstract

Biosolids are a vital resource in agriculture, providing essential nutrients for soils to enhance crop yield. Despite this, they contain a variety of unregulated contaminants, including microplastics. This means that biosolids may be acting as a vector for microplastics into agricultural soils and the wider environment. However, little is known about the fate of microplastics entering soil through this route. We therefore measured microplastic contamination in soils from five independent farms in the UK surrounding a biosolid application event. Samples were taken prior to application and at intervals up to 1-year post-application. Soil characteristics such as organic matter and particle size distribution, and environmental conditions, including rainfall, were also considered here as influencing factors in microplastic fate in soils. An oil separation method and hydrogen peroxide digestion were used to extract microplastics which were then quantified using automated μ FTIR. Microplastics were ubiquitous across farms and sampling occasions in differing quantities, suggesting that microplastic concentrations are dependent on farm management and seasonality. High variability was measured within fields with microplastics concentrations from 0- 7950 MP/kg ranging in sizes and polymer types. Additionally, microplastic concentrations did not increase directly after biosolid application, but were variable across timepoints suggesting that, despite previous reports of biosolids containing high numbers of microplastics, they were not the driving factor for soil microplastic contamination. Additional sources and environmental conditions are likely to be contributing to microplastic contamination in agricultural systems and should be further considered in future studies.

Keywords: microplastics, soils, fate, biosolids

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