Investigation into the migration of microplastics through soil

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Introduction: The prevalence of microplastics (MP), typically characterised as polymeric materials of particle size between 5 mm and 1 µm, are an increasing concern in our marine and freshwater systems. International research efforts to date have focused mainly on the abundance, characteristics and implications of plastic pollution in marine settings, with the transport and fate of plastics in terrestrial and freshwater systems being less well understood. The pathway from land to sea is significant in the Irish context given the widespread use of MP rich biosolids in agricultural land treatment[1]. This research aims to address this gap by investigating the potential movement of microplastic through soil.

Methods: Laboratory soil column experiments were conducted to investigate the migration of microplastic through soil. Columns were designed according to previous research[2], and examine varying heights of Perspex pipes 0.094 m in diameter (Fig. 1). Rainfall simulators were constructed from Perspex pipes (0.15 m (⌀) x 0.4 m (height)) perforated with 16 hypodermic needles. This research is exploring the movement of MP of varying polymer type (PVC, LDPE and PP) in two sizes: 300-150 µm and <150 µm through silica sand.

Experiments, performed in triplicates, were conducted by wet packing sand into the column, seeding the top with MP and a layer of glass beads, and subjecting the column to simulated rainfall over a fixed duration. The column was drained by gravity and samples were collected from the base. A mass balance was obtained from the analysis of water samples and dry sieving the contents within columns.

In addition to the laboratory experiments, intact cores were extracted from field sites that had been exposed to biosolid treatment with sludges from waste water treatment plants. Dispersion and depth of MP within the cores were analysed to understand their migration through soil.

Fig. 1: *Experimental set-up of soil columns*.

Results: While experiments are ongoing, preliminary results are consistent with findings of previous research[3] in that soil is a likely sink for MP. Their capacity for mobility appears low, and movement from these sinks may not be as extensive as originally thought.

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