

Diggin' up the dirt on microplastics: Presence and Distribution in Texas Urban Soils

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Introduction

Urban soils are increasingly exposed to emerging contaminants, yet microplastic contamination in urban and peri-urban soil systems remains significantly under-characterized relative to agricultural and marine environments. Despite cities and suburban environments serving as major hubs of plastic production, use, and disposal, there is limited understanding of how microplastics accumulate, distribute, and persist in urban soil matrices.

This study addresses this knowledge gap by evaluating the presence and spatial distribution of microplastics in anthropogenically influenced soils in College Station, Texas, while refining laboratory methodologies to improve recovery from complex soil matrices. By integrating contemporary field sampling with archived soil resources and advanced separation techniques, this research seeks to establish baseline data and assess methodological reliability for future large-scale assessments.

We hypothesize that soils exposed to higher anthropogenic activity will exhibit greater microplastic abundance and diversity compared to less disturbed sites. Additionally, we expect that implementing enzymatic digestion protocols will improve microplastic isolation without compromising polymer integrity.

Materials and Methods:

Soil Organic Matter (SOM) Analysis content was determined using the loss on ignition (LOI) method. Sieved soil samples (20- 30g) were oven-dried at 105° C to establish a constant dry mass, then combusted in a muffle furnace at 450° C for 8 hrs. SOM was calculated gravimetrically as the proportional mass loss between the oven-dry and post-combustion ashed states.

Microplastics were isolated from sediment samples (20-100 g) via density separation using a potassium iodide solution (KI; $\sim 1.7 \text{ g/mL}^{-1}$). Following 24 hours of agitation and a 24-hour settling period, the supernatant was recovered via a ball-valve system and vacuum-filtered through an Anodisc membrane filter. Filters were stained with DANS fluorescent dye and dried at 60° C for 1hr prior to spectroscopic analysis.

Organic Matter Digestion (OM) was removed from samples via a single-step enzymatic digestion. Samples were incubated during the previous agitation and settling period. Post-digestion, the suspension was vacuum filtered through glass fiber and membrane filters, followed by ultrapure water and ethanol rinses to maximize particle recovery.

Results

Results are pending.

Summary

This research is expected to provide foundational insight into microplastic–soil interactions in urban systems and to identify contamination gradients associated with anthropogenic activity. Future work will expand temporal analysis using archived soil collections and integrate spectroscopic calibration approaches to support scalable monitoring of microplastics in diverse soil environments.

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