

Title: Microplastics in multi-environmental compartments: Research advances, media, and global management scenarios

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Abstract: During the past decades, microplastics (MPs) have become an emerging concern due to their persistence and potential environmental threat. MP pollution has become so drastic that it has been found in the human food chain, breast milk, polar regions, and even the Himalayan basin, lake, etc. Inflammation, pulmonary hypertension, vascular occlusions, increased coagulability and blood cell cytotoxicity, disruption of immune function, neurotoxicity, and neurodegenerative diseases can all be brought on by severe microplastic exposure. Although many MPs studies have been performed on single environmental compartments, MPs in multi-environmental compartments have yet to be explored fully. This review aims to summarize the multi-environmental media, detection tools, and global management scenarios of MPs. The study revealed that MPs could significantly alter C flow through the soil-plant system, the structure and metabolic status of the microbial community, soil pH value, biomass of plant shoots and roots, chlorophyll, leaf C and N contents, and root N contents. This review reveals that MPs may negatively affect many C-dependent soil functions. Different methods have been developed to detect the MPs from these various environmental sources, including microscopic observation, density separation, Raman, and FT-IR analysis. Several articles have focused on MPs in individual environmental sources with a developed evaluation technique. This review revealed the extensive impacts of MPs on soil-plant systems, microbial communities, and soil functions, especially on water, suggesting possible disturbances to vital ecological processes. Furthermore, the broad range of detection methods explored emphasizes the significance of reliable analytical techniques in precisely evaluating levels of MP contamination in various environmental media. This paper critically discusses MPs' sources, occurrences, and global management scenarios in all possible environmental media and ecological health impacts. Future research opportunities and required sustainable strategies have also been suggested from Bangladesh and international perspectives based on challenges faced due to MP's pollution.

Keywords: Microplastics (MPs) Multi-environmental compartments Soil-plant system Ecological health impacts Microbial community alteration Carbon cycling Detection techniques Raman spectroscopy

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