



Microplastics in the Soil Ecosystem

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INTRODUCTION

Soil being a major component of an ecosystem provides various ecosystem services which are essential for life. Due to increased anthropogenic activities, soils are undergoing many problems and one such problem is soil pollution. Plastic is most serious pollutant and is found everywhere around us. Due to this inefficient management, plastic waste is released to the environment which gets degraded into smaller fragments or microplastic under the influence of various factors such as solar radiation, wind, high temperature, etc. Microplastics are defined as the plastic particles with diameters less than 5 mm (Gao *et al.*, 2020). Based on origin, microplastics are divided into primary and secondary microplastics. Primary microplastics mainly come from cosmetics, toothpaste, industrial raw materials, and resin particles while secondary ones refer to those fibres or fragments resulting from the fragmentation of larger plastic waste through physical, chemical, and biological processes. Microplastics could be classified into various types based on shape and polymer type. The use of plastic mulch, addition of organic fertilisers, plastic landfills, sewage sludge, industrial production activities, urban construction, daily life, atmospheric subsidence, automobile tire wear, etc are all sources of microplastics in the soil.

Effect of microplastics on soil environment

The existence of microplastics in soil would alter the various properties of soil such as soil aggregation, water holding capacity, bulk density (Maji and Mistri, 2021), pH, microbial population and enzymatic activity (Yi *et al.*, 2021) and ultimately influencing the soil fertility. These microplastics can also be easily absorbed by soil organisms affecting their growth, development, reproduction and even affect their gut microbiota (Lwanga *et al.*, 2017). They also get accumulated in the food chain and harm the soil organisms at different trophic levels.

Effect of microplastics on crop growth

The presence of microplastics in the soil results in decrease in nutrient availability as well as microbial activity, which finally affect the growth, development and yield of crops (Pflugmacher *et al.*, 2020). Several studies have proven that microplastics affect the seed germination, gets absorbed by plant roots through cracks and transported to shoots eventually affecting different functions of the plants.

Effect of microplastics on human health

Microplastics enters the human body either through inhalation or through contaminated food items. In human beings microplastics may become toxic as a result of oxidative stress, inflammatory lesions, or enhanced absorption or translocation (Schirinzi *et al.*, 2017). Numerous studies have shown that exposure to microplastics might potentially cause human metabolic abnormalities, neurotoxicity, and an increased risk of cancer.

Remedial measures

With each passing day, the negative effects of microplastics are increasing, creating a need to act on it immediately. Minimizing the use and discharge of microplastics is one way to reduce the accumulation of microplastics in soil. Recent ban on single use plastic by government of India is important strategy to combat plastic waste. Instead of plastic we can use bio-based and biodegradable plastic.

CONCLUSION

Currently, we now know very little about the mechanisms of action and consequences of numerous microplastics. Research on microplastics in the soil environment has picked up steam recently. To ascertain the effect of microplastics on the soil ecosystem, investigations are necessary.

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