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ASSESSMENT OF MICROPLASTICS IN LANDFILL LEACHATE, SOIL AT THE DUMP SITE AND SEDIMENTS OF A NEARBY WATER STREAM AROUND THE KARADIYANA OPEN DUMP SITE, SRI LANKA

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Abstract: Disposal of plastic wastes in landfills is widely considered its destination; these landfills may, however, serve as new origins to microplastic pollution to the surrounding environments. The Karadiyana dump site is one of the major municipal solid waste disposal sites in Sri Lanka, located adjacent to the Weras Ganga flowing into Bolgoda Lake. The study examines microplastic contamination of leachate and soil at the dumpsite, and sediments of the nearby Mada Ela stream. Leachate samples underwent filtration, digestion and vacuum filtration, while soil and sediment samples underwent drying, density separation, digestion and vacuum filtration. Samples were observed using a stereomicroscope. The microplastic contamination was detected in all samples. An active site showed the highest MP abundance in leachate (56.7 particles/L) compared to the inactive site (17.6 particles/L). Microplastic abundance in the soil was positively differentiated between active site (mean = 5078.7 particles/kg) and inactive site (mean = 6261.3 particles/kg), with a declining trend across the three rounds. One way-ANOVA revealed a significant impact of sampling round on abundance. The amount of microplastics in the sediments showed a downward trend over three rounds of sampling, where averages decreased from 4,197 particles/kg to 3,498 particles/kg, indicating a slight reduction. The dominant shapes of identified MPs were fibres and fragments, and the size category 0.1-1 mm was the most abundant in both soil and sediments. The most prevalent microplastics were transparent, white, and yellow. FTIR revealed the existence of polymers including polyethylene, polypropylene, polystyrene and polyethylene terephthalate. According to the Contamination Factor and Pollution Load Index, sediments showed moderate to high ecological risk, while leachate and soil indicated moderate pollution. The research demonstrates the importance of open dumpsites as a real source of microplastics and their ability to cause terrestrial and aquatic contamination. Specialized filtration systems should be installed to trap the MPs before the leachate and runoff move on.

Keywords: Abundance; Ecological Risk Assessment; Leachate; Microplastics; Sediments; Soil