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# Abundance, Seasonal Variation and Human Exposure of Microplastics and Tire Wear in Urban Road Dust from Colombo, Sri Lanka

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## Abstract

Urban roads are considered major transport pathways for microplastics (MPs), with tire wear particles (TWP) being identified as a major source of MPs, believed to be a significant cause of MP pollution in the natural environment. Understanding the influencing factors and abundance of MPs and TWP in road dust is important to get an insight into their behavior and spatial distribution. This study emphasizes the influence of both dry and wet seasons on MP abundance and their morphological characteristics to estimate the exposure potential of MPs in road dust in the Colombo district, Sri Lanka. Road dust samples were collected from 15 sampling sites in two sampling events: a dry-season event after an extended dry period and a wet-season event after multiple rainfall occurrences. MPs were extracted using density separation followed by chemical digestion. The results confirmed the presence of MPs in all tested samples. The average abundance of MP was 655±75 particles $kg^{-1}$ during the dry spell and 214±26 particles $kg^{-1}$ during the wet season. The Wilcoxon signed-rank test revealed a significant seasonal difference in MP abundance ($V=120$, $p<0.001$), with a large effect size ($r=0.873$), indicating a strong rainfall impact on MP abundance in road dust. Black was the most prominent MP color, accounting for more than 70% in both dry and wet seasons. The dominant shape was found to be fragments, which increased from 79.63 to 81.62% with rain. A clear shift in particle size distribution was observed, as 2-5 mm size MPs were more frequent during the dry season, and 1-2 mm size MPs were more frequent during the wet season. The Fourier Transform Infrared (FTIR) analysis identified Rubber, Polyethylene (PE), Polyethylene Terephthalate (PET), Polypropylene (PP), Polystyrene (PS), Polyamide (PA), and Polyvinyl Chloride (PVC) as the common polymer types in samples. The PP and rubber were detected as the predominant polymer types, 20.99% and 24.44%, respectively, in both dry and wet seasons. The estimated acute ingestion of MPs via incidental road dust for children, in both wet and dry seasons, was approximately three times higher than that for adults, indicating a higher potential exposure in children. These findings conclude a noticeable influence of rainfall on MP abundance, leading to reduced potential human exposure.

**Keywords:** *Microplastics, Road dust, Dry-wet seasons, Polymer types, Human exposure*