Title: SEM–EDS-based rapid measurement and size-fractionated speciation of airborne particulate matter and associated metals utilizing plant leaves.

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Abstract: This study was conducted to assess particulate matter pollution and the accumulation of airborne toxic metals by studying the foliar deposition pattern in an urban environment. To this end, two commonly growing plants (*Senna siamea* (Lam.) H.S.Irwin & Barneby and *Alstonia scholaris* (L.) R.Br.) from the busiest traffic squares of the city (Nehru Chowk) in Bilaspur, India, were selected for detailed study. For this purpose, plant leaf samples of both plant species were collected from pollution-affected areas and a reference site (unpolluted) in the city and examined by scanning electron microscopy and energy dispersive X-ray spectroscopy (SEM–EDS) to estimate the accumulation of PM-bound toxic metals at the leaf surfaces. The results of this study showed that the leaves of both plants accumulate PM in different size ranges. Although both plant leaves showed accumulation of PM from respirable suspended particulate matter (RSPM) to ultra-fine particles (UFPs: < 0.1: less than 100 nm) range along with toxic metals, *S. siamea* retained a higher level of PM than *A. scholaris* due to better micro-morphological properties on both leaf surfaces. The size of some PM was found to be smaller than the stoma openings. The EDS study proved the presence of harmful airborne toxic metals (Pb, Cd, Cu, Zr, Al, Co, etc.) in these PMs of ambient air. This indicates that toxic metals can enter the leaves through stomatal openings. The results of this study recommended that both plants can be used as a tool to minimise PM pollution.

Keyword: Metal Accumulation, Particulate Matter, Toxic Metals, Leaf Morphology, Surface Accumulation.

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