

## SEQUESTRATION OF TRAFFIC RELATED HEAVY METALS IN THE LEAVES OF ROADSIDE PLANTS IN A MEGACITY

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### Introduction

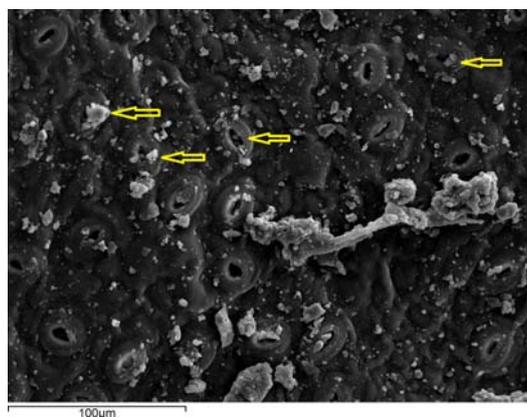
The aerial parts of the plants are capable of capturing the airborne dust (Ram et al., 2014). The airborne dusts are often contaminated with traffic related heavy metals such as Cr, Cd, Cu, Zn and Pb (Sutherland et al., 2012). The dust particles contaminated with heavy metals frequently find their path into leaf tissues through stomata (Uzu et al., 2010). In the present study, an attempt was made to check the accumulation of traffic related heavy metals such as Cu and Zn in the roadside plant.

### Methods

The study was conducted at different sites with heavy traffic load in and around Kolkata, India. Leaves of roadside trees were collected from a height of 10 ft above the ground. The dusts from the surfaces of the leaves, dried leaf tissues were analysed for heavy metal content using Energy Dispersive X-Ray Fluorescence (EDXRF) and Proton Induced X-ray Emission (PIXE) Spectrometry techniques. The morphological features like surface structure, trichomes, stomata and dust particles on leaf surfaces were analysed under Scanning Electron Microscope (SEM).

### Results

The range of Cu and Zn were observed to be in the range of 8-26 ppm and 12-49 ppm respectively. Scanning electron microscopy showed the deposition of re-suspended dust particles inside the stomatal openings and suggests the uptake of heavy metal contaminated particle through stomata.



**Figure 1.** Scanning electron micrograph of lower surface of *Polyalthia longifolia* leaf, arrows showing dust particulates in and around stomatal opening

## Conclusion

The results showed high levels of Cu and Zn and indicated a possible metal sequestration in the plants. There is still need of further study to confirm the pathway of heavy metals into the plants through leaves.

## References

- Ram, S. S.; Majumder, S.; Chaudhuri, P.; Chanda, S.; Santra, S. C.; Maiti, P. K.; Sudarshan, M.; Chakraborty, A. (2014) Plant canopies: bio-monitor and trap for re-suspended dust particulates contaminated with heavy metals. *Mitigation and Adaptation Strategies for Global Change*, 19(5), 499-508.
- Sutherland, R. A.; Tack, F. M. G.; Ziegler, A. D. (2012) Road-deposited sediments in an urban environment: A first look at sequentially extracted element loads in grain size fractions. *Journal of Hazardous Materials*, 225, 54-62.
- Uzu G, Sobanska S, Sarret G, Munoz M, Dumat C. (2010). Foliar lead uptake by lettuce exposed to atmospheric fallouts. *Environ. Sci. Technol.* 44, 1036–42.