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Determination of enhancement of atmospheric heavy metal concentration and total nitrogen content in moss from traffic exposure

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Heavy metal concentration and total nitrogen content were surveyed using moss as a bioindicator. The effect of NO_x emissions from traffic on moss tissue nitrogen and tissue concentrations of Pb, Cu, Cd and Cr were determined. Moss species, *Barbula unguiculata* (70 samples) growing next to roads that were exposed to different traffic densities as high, medium and low were collected from different sites in the Western province of Sri Lanka. Selection of the sampling sites were based on google map online traffic application. Results were compared with background level concentrations of heavy metals and total nitrogen content obtained from Sinharaja rain forest where the anthropogenic influence is minimum. Bioaccumulation of heavy metals were determined by Atomic Absorption Spectrophotometer (AAS). Colorimetric method and the conventional Kjeldhal method were compared for the determination of total nitrogen content and the total nitrogen amount was determined using the rapid colorimetric method. Background levels of Pb, Cu, Cd and Cr were $7.23 \pm 2.11 \mu\text{g/g}$, $5.53 \pm 1.75 \mu\text{g/g}$, $0.17 \pm 0.06 \mu\text{g/g}$ and $6.61 \pm 2.58 \mu\text{g/g}$ respectively. Background sites showed a total nitrogen content of $3.25 \pm 0.05 \text{ mg/g}$. Mosses collected from sites that were exposed to high traffic had a total nitrogen content ranging between 7.19 - 13.16 mg/g. The Pb, Cu, Cd and Cr contents had ranges between 30.87 - 45.98 $\mu\text{g/g}$, 63.73 - 95.24 $\mu\text{g/g}$, 3.22 - 3.76 $\mu\text{g/g}$ and 41.98 - 64.12 $\mu\text{g/g}$ respectively. Sites that were exposed to medium traffic showed a total nitrogen content ranging between 6.62 - 8.67 mg/g. The Pb, Cu, Cd and Cr contents had ranges between 21.17 - 28.39 $\mu\text{g/g}$, 44.38 - 56.09 $\mu\text{g/g}$, 1.59 - 2.94 $\mu\text{g/g}$ and 24.60 - 41.41 $\mu\text{g/g}$ respectively. Sites that were exposed to low traffic showed a total nitrogen content ranging between 6.84 - 10.63 mg/g. The Pb, Cu, Cd and Cr contents had ranges between 10.40 - 13.62 $\mu\text{g/g}$, 26.36 - 39.83 $\mu\text{g/g}$, 1.06 - 1.62 $\mu\text{g/g}$ and 16.71 - 19.54 $\mu\text{g/g}$ respectively. This work indicates that the heavy metal contents have a positive correlation with the traffic exposure with Cu being greater than other heavy metals (Pb, Cr, Cd) and that the total nitrogen content does not show a clear correlation with the traffic exposure. Therefore, in order to obtain a positive correlation, the traffic exposure should be compared with the stable isotope ratio ($\delta^{15}\text{N}$).

Keywords: Heavy metals, moss, nitrogen, traffic