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Use of moss (*Barbula* sp.) as a bioindicator to monitor atmospheric deposition of polycyclic aromatic hydrocarbons (PAHs): identification and quantification

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The atmospheric deposition of PAHs was investigated qualitatively and quantitatively by analyzing moss (*Barbula* sp.) used as a bioindicator in this study. *Barbula* sp. has only been identified to the generic level. In June 2010, moss samples were collected from five different sampling sites (i.e. Fort, Sedawatta, Dalugama, Sapugaskanda, and Biyagama) in the Western Province. The background level was monitored using moss (*Barbula* sp.) collected from Kosmulla, a village bordering the Sinharaja forest where anthropogenic influence is low.

Analysis of PAHs was carried out using high performance liquid chromatography (HPLC, Agilent 1100 series) with a UV detector (Agilent 1200 series) after extracting the moss samples separately by the Soxhlet extractor and cleaning using a silica gel column. A C18 column (VYDAC PAH column) was used as the stationary phase and methanol: water (93:7 v/v) was used as the mobile phase. Statistical analysis was carried out using MINITAB 14 software (Minitab Inc., Pennsylvania, USA).

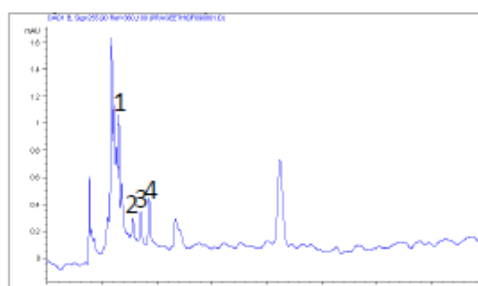


Fig.1: HPLC trace for moss extract

Four low molecular weight PAHs namely naphthalene (1), phenanthrene (2), anthracene (3) and fluoranthene (4) were identified by comparing with retention times and spiking with standards (Supelco USA) and were quantified using an external calibration method. The concentrations of total detectable PAH at sampling sites ranged from 2703 – 45197 $\mu\text{g kg}^{-1}$ dry weight of moss (*Barbula* sp.) with a mean value of $1.678 \times 10^4 \mu\text{g kg}^{-1}$. One way ANOVA showed that there was a significant difference of total PAHs at the Fort site compared to the other sites at 95 % confidence level. The total detectable PAH concentration was compared with the PAH levels in vegetation samples collected from different regions around the world obtained from the literature. The highest PAH accumulated concentrations were found in *Barbula* sp. when compared with other plant species used as bioindicators. Further studies need to be carried out using HPLC-MS to confirm the identification of the above PAHs.