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Air quality monitoring potential of corticolous lichens in tropical environment

A M N P Attanayaka[1] and S Chandrani Wijeyaratne[1*]
[1]*University of Sri Jayewardenepura, Nugegoda*

In this study, thirty-one sites located on six transects radiating from Colombo Fort were selected to investigate air quality monitoring potential of lichens. Six trees belonging to three species, (*Cocos nucifear*, *Mangifera indica* and *Artocarpus hetrophyllus*) and two more trees belonging to any other species were used at each site of 1km ^{2} area to monitor diversity and distribution of corticolous lichens. Coverage and frequency of lichens were recorded by placing 250cm^2 (25cm X 10cm) quadrate randomly at four places on the bole of each tree. All lichen species found within the gird, number of individuals of each species and the number of grid units in which a particular species recorded were estimated. Samples of lichens collected were identified using their morphology, anatomy, chemistry and reproductive characters. Lichen diversity of each site was determined using Shannon's diversity index. Using frequency or percentage cover of lichens and a factor of tolerance of toxicity given by ecological index (i.e. the average number of species, which coexisted with each species), the Index of Atmospheric Purity was calculated for every site according to the following formula, where n= Number of species recorded. Q = Ecological index (average number of species, which coexisted with each species), *f* = Cover or frequency of each species. IAP = $\sum^{n}_{1}$ (Q x *f*) / 10

Ambient SO_2 and NO_2 at each site were monitored using passive samplers. Land use pattern, traffic density, pH of substrates, and exposure of trees to light were also recorded. Data were statistically analyzed using mean comparison, correlation and by principal component analysis. IAP values of sites increased along all transects when moving from the city to suburbs indicating better air quality. Correspondingly, ambient SO_2 and NO_2 concentrations gradually decreased in sites from city to suburbs during the same period. Highest SO_2 (48.35 µg/m^3) and NO_2 (42.82 µg/m^3) levels were recorded from Fort. Relationship between diversity of lichens and levels of SO_2 and NO_2 was negatively correlated. Principle component analysis revealed that principal components, PC1, PC2 and PC 3 explained 38%, 20% and 15%of the total variation in data set respectively. Biplot developed by PC1 vs. PC2 revealed that low lichen diversity class separated from other classes due to increased concentration of SO_2 and NO_2, land use pattern and traffic density all of which are included in PC1. It could be concluded that lichens of the tropics have the potential to be used in air pollution monitoring and IAP method is valid for tropics as well.

*chandrani_wijeya@yahoo.com Tel: 011-2910171