

**Assessment of the Impacts of Atmospheric Pollution on Floristic Diversity and the Use of Lichens as Indicator Species for Assessing Atmospheric Pollution: in Sri Lanka:
A Case Study of Three Tropical Forests in Central Highlands of Sri Lanka**

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Abstract

The impacts of atmospheric pollution reach distant locations and are not restricted to the vicinity of the polluting sources. Pollutants of fine particulate matter impact the carbon, nutrient, and water cycling, primary production, crop and timber production in forest ecosystems. In Sri Lanka, fewer research studies have been carried out in assessing the impact of atmospheric pollution on forest ecosystems and also the use of lichens as a bioindicator in this context. Three forest reserves belonging to sub montane tropical forest category was selected for the study. The selection of the location was influenced by the fact that continuous monitoring of air pollutants had been done by the Central Environmental Authority in Kandy City and its environs. The three forest reserves located in the neighborhood of the Kandy City was taken for the study; Udawatte Kelle Forest Reserve, Gannoruwa Forest Reserve and Hanthana Forest Reserve. Transects having the width of 5m and plot length of 100m were laid in these forest reserves from the most disturbed areas to less disturbed areas. In each transect, the diameter at breast height (DBH) and height were recorded in all the plants having more than 5 cm DBH. The plants in the undergrowth were identified at generic and species levels. Samples of leaves, litter, soil were taken to the laboratory for analysis of nutrients; organic carbon, electric conductivity, pH, available potassium, nitrogen, Cation Exchange Capacity. Corticolous lichens (Lichens growing on tree trunks) above 1.5 m from the ground level were recorded in trees having >5 cm DBH in the plot. All lichens species were recorded and identified to the generic level, while some of the species were identified only to the family level at the field. Furthermore, numbers of thalli were counted excluding non-propagative thalli. The lichen samples taken to the laboratory were identified using light microscope, classified according to indicator species of air pollution based on the available literature. The results showed that despite the fact that the atmospheric levels of pollutants (PM_{2.5}, PM₁₀, CO, NO₂, SO₂, O₃) were within the maximum permissible levels in the Kandy City and the neighborhood, Hanthana Forest Reserve showed lower levels for all the pollutants compared with the other two as it was located further away from the City. In the disturbed areas both the species diversity, lichen diversity was reduced showing some correlation with the level of disturbance. With regards to occurrence of lichens, Crustose lichens were the most abundant especially in the more disturbed areas and the occurrence of same was the least in Hanthana Forest Reserve which was the least disturbed among the three. Foliose lichens did not occur in Udawatte Kelle which was a high disturbed area. The bark pH in all the trees sampled showed values ranging from 5.4 to 6.0 and a significant relationship between bark pH and the lichen diversity could not be observed. Disturbed ecosystems shows poor nutrient cycling as their functions become stressed compared with the more naturalized ones.

Keywords: Air pollution, Lichens, Forests, Biodiversity, Nutrient cycling