

Assessment of Epiphytic Lichen Diversity in Pine Plantations and Adjacent Secondary Forest in Peacock Hill, Pussellawa, Sri Lanka

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Abstract Lichens have been widely considered as sensitive bioindicators of forest health and ecological continuity as well as atmospheric pollution. This study was conducted to assess the variation of lichen diversity in pine plantations and adjacent secondary forest located in Peacock hill, Pussellawa in Central Province of Sri Lanka, and the potential of use those lichen species as bioindicators of environmental stress. The frequency of occurrence of lichen species on a defined portion of tree bark was used as an estimate of diversity and to evaluate the degree of environmental stress on the sensitive lichen community. In total 19 lichen taxa were recorded in trees in the study site of them 16 were crustose lichens, 03 foliose and no fruticose lichens were recorded. Lichen Diversity (LD) values were generated based on the recorded epiphytic lichens. Crustose lichen form was the most frequently encountered lichen form among study sites and the quality of the environment in pine plantations was assessed as relatively low compared to the adjacent secondary forest. This may also be due to the lack of lichen propagules or suitable substrata for colonization for lichens in the pine plantations. Lowest LD value of disturbed pine plantation, located in close proximity to the main road, and the highest LD value for secondary forest indicated the possible air pollution due to vehicular emissions, which could have influenced on the diversity of lichens. However, with respect to the previous researches, lichen diversity was very low in secondary forest compared to other pristine forests in Sri Lanka and that may be due to disruptions in ecological continuity that prevailing in the study site. Results of the present study suggest that lichens can be considered as potential indicators in assessing degree of environmental stress, air pollution and ecological continuity within different vegetations and in regenerating habitats.

Keywords Lichen diversity, Environmental stress, Ecological continuity, Secondary forest, Pine plantation

1. Introduction

Lichen is an organism that is composed of a mycobiont (fungal partner) and a photobiont (alga or cyanobacteria) growing together in a symbiotic relationship, where the two organisms growing together rely on each other for their survival. The photobiont is sensitive to a wide range of environmental conditions which determine the distribution pattern of the lichen. The mycobiont contains a diversity of chemical substances for the protection of the photobiont which extend their ecological range. Thus lichens are sensitive to changes in atmospheric and micro-climatic conditions and have been used as bioindicators to determine the environmental stress in tropical and temperate countries [1].

Various factors govern the growth and development of lichens on tree trunks in different habitats. These include

macroclimatic factors, microclimatic factors, site factors, substrate characteristics and etc [2-4]. Variation of macroclimatic factors; rainfall and temperature affect lichen development pattern in different geographical regions. Microclimatic factors such as light, humidity and temperature are the most vital factors that cause variation within the site. Site factors such as age, composition, management practices and pollution of the forest also affect lichen development. Substrate characteristics of tree species such as bark type, surface corrugation, moisture retention, pH and nutrient status of the bark influence the growth of lichens on a tree. But the influence of above factors on lichen development in a given ecosystem considerably varies [5].

A few recorded systematic studies on the distribution and diversity of lichens in different geographical regions are available in Sri Lanka due to the lack of knowledge of the taxonomy of tropical lichen species, their ecology and the community structure [6]. The first collection of lichens of Sri Lanka was made by G. H. K. Thwaites in 1868 followed by the recognition of 199 species by W.A. Leighton in 1870. Several researchers and authors [7-18] have contributed to increase the number of recorded lichen species in Sri Lanka

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