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Epiphytic Cryptogams in the Beraliya-Elpitiya Forest Reserve: Diversity Patterns across Successional Stages

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Abstract

Epiphytic cryptogams, which include algae, fungi, lichens, bryophytes and ferns, are vital components of tropical rainforests, contributing to ecosystem functions such as nutrient cycling, moisture retention, and serving as bio-indicators of forest health. This study focused on the diversity of epiphytic cryptogams in the Beraliya-Elpitiya Forest Reserve (6º19'–6º20' N, 80º10'–80º11' E), located in Pituwala, Sri Lanka. This research aims to assess species diversity and the influence of environmental factors on cryptogamic diversity. Field surveys were conducted across various microhabitats, including tree trunks (from base to DBH), from three different forest successional stages: early, intermediate, and late using stratified random sampling method. Collected samples were identified using taxonomic keys through morphological characters. Environmental parameters such as temperature, humidity, and precipitation were recorded to understand their impact on species diversity. A total of 70 cryptogam species were collected, consisting of five lichen species, four fungi species, 59 bryophyte species, and two fern species. When comparing the Shannon index values of each successional stage, the late successional stage had the highest Shannon index. Higher values of *H'* represented the greater epiphytic cryptogamic diversity. Therefore, the late successional stage in the Beraliya-Elpitiya Forest Reserve showed the highest diversity when compared to the early and intermediate stages. A one-way ANOVA was conducted to compare the three successional stages. There was a significant effect of the successional stage on diversity at the $p<0.05$ level for the three conditions [$F(2, 6) = 6262.57$, $p = 1.098e\text{-}10$]. These results suggested that the successional stage significantly impacts on the epiphytic cryptogamic diversity. Pearson correlation coefficients were calculated to assess the strength and direction of associations between temperature, precipitation, humidity, and species diversity in the Beraliya-Elpitiya Forest Reserve. The analysis revealed a negative correlation between temperature and species diversity and the precipitation and humidity positively correlated with species diversity. This research highlights the importance of conserving tropical forest habitats, as epiphytic cryptogams are sensitive to environmental changes, including deforestation, climate change, and habitat fragmentation. The findings provide preliminary data for future biodiversity monitoring and ecological studies in this region. Protecting the cryptogamic diversity of the Beraliya-Elpitiya Forest Reserve is significant for maintaining the overall health and resilience of this tropical rainforest ecosystem.

Keywords: *Cryptogams, Diversity, Ecosystem, Impact, Successional stages*