



Revealing the Phylogenetic Affinities of Mangrove Species in Sri Lanka Based on *rbcL* Gene Sequence

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Mangroves are unique coastal ecosystems that heavily contribute to biodiversity, coastal protection and climate resilience. Traditional classification of the species-rich mangrove communities along the coast of Sri Lanka has relied heavily on plant morphology. The convergence and hybridization mechanisms make many species superficially indistinguishable and create significant taxonomic confusion, which affects biodiversity assessments and conservation workflows. To resolve these limitations, this study presents the first comprehensive molecular phylogenetic classification of Sri Lankan mangroves using the chloroplast ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit (*rbcL*) gene marker. Total Genomic DNA from 21 mangrove species (84 samples across the island) was isolated via optimized CTAB and silica extraction methods, followed by PCR amplification and sequencing of the *rbcL* marker. Phylogenetic reconstructions using Maximum Likelihood and Bayesian Inference successfully placed our isolates in 13 genera across 10 families. The molecular phylogeny revealed the status of *Rhizophora anamalayana*, clarifying that it is not a distinct species as previously debated but a natural hybrid of *R. apiculata* and *R. mucronata*, exhibiting a 0.16% to 0.32% base pair difference respectively in the *rbcL* marker with its reference specimen. Furthermore, *Ceriops tagal* specimens from Trincomalee and Puttalam areas exhibited differences in morphology, while no significant difference was observed (< 0.01%) in *rbcL* marker sequences in the phylogenetic analysis. In future studies, it is essential to conduct comparative chloroplast genome analysis coupled with ecological studies to obtain high resolution in molecular phylogeny for deep taxonomic insights and ecological studies to enhance mangrove conservation, restoration, and climate resilience. This study underscores that molecular phylogenetics is an indispensable tool for accurate species delimitation, natural hybrid tracking, and establishing baseline data to guide future conservation and policy management.

Keywords: Mangroves, *rbcL* marker, *Rhizophora anamalayana*, Sri Lanka, Taxonomy