A COMPARATIVE ANALYSIS OF CHLOROPHYLL FLUORESCENCE AND OTHER FUNCTIONAL TRAITS AMONG 20 LOWLAND RAINFOREST SPECIES IN SOUTHWEST SRI LANKA

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Chlorophyll fluorescence analysis is useful for detecting plant stress. Maximum quantum yield ($Ø_{PSIImax}$), quantum efficiency ($Ø_{PSII}$), and electron transpiration rate (J) can determine the efficiency of leaf light utilization. Leaf traits and fluorescence determine seedling survival. The main objective of this study was to examine variations in chlorophyll fluorescence and other functional traits in 20 lowland rainforest species in Southwest Sri Lanka. The traits in 20 species were measured at the Endane Biodiversity Corridor Nursery at Dilmah Conservation of Sri Lanka. A series of leaf morphological and physiological traits; leaf mass per area (LMA), leaf dry matter content (LDMC), leaf vein density (VD), leaf thickness (LT), and SPAD values were measured from pioneer and climax seedlings. The SPAD values showed a strong positive correlation with the $Ø_{PSII}$ ($r=0.48$, $p<0.0001$), weak negative correlations with $Ø_{PSIImax}$ ($r=-0.06$, $p<0.01$) and J ($r=-0.47$, $p<0.05$) suggesting leaf chlorophyll and N content greatly affect light utilization efficiency. The SPAD values were positively correlated with LT ($r=0.69$, $p<0.0001$), LMA ($r=0.33$, $p<0.0001$), and negatively with VD ($r=-0.63$, $p<0.001$) suggesting that these morphophysiological traits support to increase light utilization efficiency. The climax species have significantly greater $Ø_{PSIImax}$, LDMC, LMA, LT, and SPAD values than the pioneer species ($p<0.001$). Overall, the functional traits of climax species seedlings indicate a high tolerance for shade, and their canopy position reflects their preferred habitat. The observations of this study aid site-specific species matching for rainforest restoration in Sri Lanka.

Keywords: Chlorophyll fluorescence, Functional traits, Light utilizing efficiency, Seedling survival, Species selection