A COMPARATIVE ANALYSIS OF DROUGHT TOLERANCE IN A TROPICAL DRY SECONDARY FOREST COMMUNITY IN CENTRAL SRI LANKA

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Climate change impose drought conditions on forest ecosystems including those in forest communities of Sri Lanka. Attributing to over 2/3rd of the forest cover of the country, tropical dry forests are in the regions vulnerable for seasonal droughts. At leaf level, water potential at the turgor loss point (πtlp) is a key indicator of drought tolerance. We measured πtlp by developing pressure-volume curves for 200 tree individuals representing 20 species across the vertical stratification in a secondary dry forest regenerated though assisted natural regeneration in the Sam Popham Arboretum, Dambulla, Sri Lanka. A series of leaf morphological and physiological traits; πtlp (estimated using bench dry method), osmotic potentials at the turgor loss point (πo), modulus of elasticity (ε), Specific Leaf Area (SLA), and Leaf Dry Matter Content (LDMC) were measured representing the canopy and understory strata. These tropical dry forest species showed a wide range of drought tolerance as indicated by a range of πtlp values (-0.18 to -2.67 MPa) with a mean of -0.45 MPa. This range indicates the adaptation of trees to the seasonal extreme droughts. Canopy species showed lower (-0.57 Mpa) and wider range of πtlp than the understory shrubs (-0.31 MPa, $F=10.784$). In comparison to a global dataset of πtlp, tree species in this study appears to be less drought tolerant than woody species in other tropical ecosystems. Moreover, the πtlp and πo showed a strong interspecific trait correlation (Pearson, $r=0.97$, $p<0.0001$) suggesting the possibility of determining the πtlp using osmometry. Leaf morphological traits (SLA & LDMC) showed positive but very weak correlations with the πtlp and other p-v curve parameters (i.e., ε and capacitance). While indicating the susceptibility of some dry forest tree species to drought, our observations facilitate the selection of drought tolerant tree species for restoration of tropical dry forests in Sri Lanka.

Keywords: Climate change, Drought tolerance, Plant functional traits, Tropical dry forests, Turgor loss point