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Paper: Sustainability

Development of allometric equations to determine above and below ground biomass and organic carbon content in *Bruguiera gymnorrhiza* and *Lumnitzera racemosa*

Bruguiera gymnorrhiza and *Lumnitzera racemosa* are two species of true mangroves commonly found in Sri Lankan mangrove areas. Determination of amount of carbon assimilated by these two species therefore, is of considerable importance to estimate the carbon fixing capacity of Sri Lankan mangrove areas. Objective of the present study therefore, is to develop allometric relationships between biomass of stems, leaves, below and above ground roots with easily measured variables such as girth/ diameter at breast height (gbh/dbh) that can be used in estimating the carbon assimilation capacity of Sri Lankan mangrove ecosystems.

The below ground biomass of trees of the two mangrove species accounted for 20 – 44 % of the total biomass of the plants. The ratio (A/B) between above (A) to below (B) ground biomass of *Lumnitzera racemosa* ranged 1.4 – 3.9 and that for *Bruguiera gymnorrhiza* was 1.2 – 4.4, indicating relatively greater amount of biomass in the below ground root systems. Data on dry weight of plant components were analyzed with SPSS ver.16 and a strong positive correlation ($p < 0.01$) and non-linear relationship ($r^2 > 0.80$) were revealed for stems, roots, above ground and total biomass of plants with dbh of individuals of the two species. Four allometric equations were derived between biomass of different components with dbh of *Bruguiera gymnorrhiza*; biomass of stem = $0.115 (\text{dbh})^{2.386}$, biomass of root = $0.100 (\text{dbh})^{2.364}$, above ground biomass = $0.289 (\text{dbh})^{2.327}$ and total biomass (above +below) = $0.405 (\text{dbh})^{2.320}$. Four other allometric equations were derived between biomass of different components with dbh of *Lumnitzera racemosa*; biomass of trunk = $0.098 (\text{dbh})^{2.244}$, biomass of root = $0.118 (\text{dbh})^{2.063}$, above ground biomass = $0.114 (\text{dbh})^{2.523}$ and total biomass (above +below) = $0.220 (\text{dbh})^{2.376}$. Using the organic carbon content embodied in biomass of the components of the plants of the two species, equations were altered to represent the relationship between organic carbon present and the dbh. Organic carbon content in *Bruguiera gymnorrhiza* stem = $0.0631 (\text{dbh})^{2.386}$ and root = $0.0529 (\text{dbh})^{2.364}$ and organic carbon content *Lumnitzera racemosa* trunk = $0.0546 (\text{dbh})^{2.244}$ and root = $0.0624 (\text{dbh})^{2.063}$.

These allometric relationships are required to estimate the amount of carbon accumulated in the plants of these mangrove species and thus the carbon assimilation capacity of the mangrove stands that comprise these mangrove species.