Carbon retention capacity of two mangrove species, Bruguiera gymnorrhiza (L.) Lamk. and Lumnitzera racemosa Willd. in Negombo estuary, Sri Lanka

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Abstract

Carbon accumulation/sequestration by plants is a major function that contributes to removal of carbon dioxide from the atmosphere and capacity to perform it depends on the plant species and environmental conditions under which they live. Carbon retention by natural ecosystems such as mangroves therefore, is considered a crucial ecological service, and valued highly under the current global context of continued increase in greenhouse gas emission and associated climate change, on which marginal effort has hitherto been spared over its quantification. The Present study was conducted to characterize two true Sri Lankan mangrove species, i.e. *Bruguiera gymnorrhiza* (L.) and *Lumnitzera racemosa* Willd.,. with respect to their carbon retention capacity, and to develop allometric relationships between biomass of plant components and stem diameter at breast height (dbh) of the two species with a view to assisting quantification of carbon-sink function of mangrove ecosystems. Fourteen trees of *B. gymnorrhiza,* and ten trees of *L. racemosa* that represented the range of dbh distribution in the mangrove area at Kadolkele in Negombo estuary were selected, harvested and dry weights (biomass) were obtained of the components based on wet:dry weight. Organic carbon in samples taken from each plant component of the two species was determined using dichromate oxidation and colorimetry using spectrophotometer. Partitioning of biomass between above (A) and below (B) ground components is approximately 3:1, revealing that the pattern resembles more of that of terrestrial plants (A/B = 3.9-4.5) than mangrove species in higher latitudes (A/B = 2-3). A positive correlation ($p<0.01$) and non-linear relationship (linear log-log relationship) was revealed between dbh and biomass (component and total) of the two species and allometric equations were derived that could be used to quantify carbon-sink function of mangrove ecosystems comprised of these species and the potential of mangroves in carbon mitigation programmes with financial incentives for mangrove conservation. The average amount of carbon retained by an individual was 9.16 kg per tree and thus the total organic carbon retained by *L. racemosa* in the mangrove ecosystem in Kadolkele was 9.44 t/ha while that of *B. gymnorrhiza*, was 5.6 t/ha, despite its greater capacity of individual carbon retention (13.76 kg per tree) due to its relatively low density and basal area. *L. racemosa* contains higher percentage of carbon in the stems, branches and roots than *B. gymnorrhiza*,