(104)

Impact of Intra Specific Competition on Carbon Stock Accumulation in *Lumnitzera racemosa:* A Case Study Using the Hegyi Index

Saputhanthri, A.P.*, Kumara, M.P.
Department of Fisheries and Marine Sciences, Ocean University of Sri Lanka, Tangalle, Sri Lanka
**pramodyasaputhanthri@gmail.com*

Abstract

Mangrove ecosystems are highly efficient natural carbon sinks, playing a critical role in climate change mitigation by sequestering and storing large amounts of atmospheric carbon. *Lumnitzera racemosa* had formed a monospecific stand in a regenerated area of Rekawa Lagoon, Sri Lanka, which regenerated over 12 years. Intraspecific competition is a critical ecological factor influencing biomass accumulation and carbon storage in mangrove ecosystems. This study aimed to evaluate the impact of intraspecific competition on carbon stock accumulation in *L. racemosa* using the Hegyi Competition Index (HCI). Fieldwork was carried out across 15 systematically established plots of 5×5 m, with all individual trees measured for diameter at breast height and height. Biomass components, including stem, leaf, root, above ground, and total biomass were estimated using species-specific allometric equations, and carbon stocks were calculated using a standard conversion factor. The Hegyi index was calculated for each tree based on the proximity of neighboring conspecifics to determine competition intensity. Regression analysis results indicated a generally negative, but not statistically significant relationship between competition intensity and total carbon stocks of *L. racemosa*. Total carbon ranged (574-1,732 Mg C ha^{-1}), with stem carbon (40.79-256.67 Mg C ha^{-1}) contributing most, followed by root carbon (30.59-193.20 Mg C ha^{-1}), leaf carbon (25.41-198 Mg C ha^{-1}), and above-ground carbon (100.20-621.51 Mg C ha^{-1}). Specifically, total carbon (Coef=14,074; p=0.104), stem (-1,919; p=0.147), root (-1,417; p=0.141), leaves (-198; p=0.139), and above-ground (-4,649; p=0.136) all decreased with higher competition. These findings indicate that intraspecific competition showed a negative but non-significant effect on carbon accumulation. These insights can guide mangrove restoration and management practices, such as optimizing tree spacing and density, to enhance carbon sequestration, coastal ecosystem resilience, and climate change mitigation.

Keywords: *Lumnitzera racemosa, Mangrove, Carbon stock, Intra-specific competition, Hegyi Index*