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The Impact of *Avicennia marina* Root Density on Leaf Litter Retention and Soil Carbon Variation

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Abstract

Avicennia marina, an abundant mangrove species, contributes significantly to soil carbon by falling leaf litter, but its retention could potentially cause sinking carbon to adjacent soil. The knowledge about the impact of dense roots on leaf retention and subsequent soil carbon variation is limited. The pencil roots of *Avicennia marina* trees could also support leaf litter retention and soil carbon. But it has not been tested this far. The role of *Avicennia marina* pencil root density on leaf litter retention and soil carbon in the soil is unknown. The current study aimed to address the relationship between leaf litter retention, root density, and surface soil carbon change in the *Avicennia marina* microhabitat. The objectives used for this were to determine whether there is a relationship between leaf litter retention along with different root densities, correlating a relationship between root density and soil carbon variation in the *Avicennia marina* by evaluating soil carbon content at different depth layers. The data were collected in an *Avicennia marina* micro habitat in the mangrove forest area adjacent to the Rekawa lagoon from November 23rd to December 23rd, 2023. Nine random quadrats (50cm×50cm) were demarcated at the microhabitat with different root densities. All the leaf litter was collected, and the total dry mass of each quadrant was calculated. Root densities were calculated as the number of roots per $1m^2$. Carbon content of soil samples obtained from a 0-15cm depth layer were evaluated by Loss On Ignition (LOI) at 450 ºC for 4 hours. According to the linear regression tests, the total dry mass of the leaf litter for (50cm×50cm) plots had shown a significant negative relationship ($p<0.05$) between root densities and the leaf dry masses but there was no significant relationship ($p>0.05$) between root density (no. of roots per $1m^2$) and carbon in each soil layer (g), measured as relative to the average surface level as 0-5, 5-10, 10-15 cm. According to the two-way ANOVA test, core carbon content significantly varied between the nine quadrates ($p<0.05$) but not between the three different layers ($p>0.05$). Decline of leaf litter content with increasing root density per quadrant shows decreasing the number of roots enables more leaf litter to accumulate and improve the carbon sinking potential. But there is no significant change of carbon in the soil layers. However, there is a significant difference in soil carbon content between each root density.

Keywords: *Soil carbon, Avicennia marina, Root density, Leaf litter*