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The belowground root production of a 17 years old *Rhizophora mucronata* plantation is not different from natural mangrove sites: Pambala- Chilaw lagoon, Sri Lanka

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The belowground productivity of mangroves plays a significant role in sinking carbon dioxide which could be assessed in terms of dry biomass of the roots. The densities of different root types also help in predicting the root yield and the ability of the trees to absorb soil nutrients. Previous studies have shown great variation in belowground productivities of mangrove from different geographic regions indicating the need to publish more regional studies in order to calculate global average values. Such studies would also draw attention towards local mangrove conservation against ongoing destructions. Published articles on mangrove belowground biomass and root dynamics in Sri Lanka are scanty and in particular a comparative study between natural and planted mangroves is yet to be done. In order to reduce the above study gap, four random root cores (40 cm deep and 15 cm diameter) were withdrawn from three 10 m x 10 m replicates of each natural *Rhizophora mucronata* (7□ 30′ 51.6″ N 79□ 49′ 32.3″ E), *Excoecaria agallocha* (7□ 30′ 43.5″ N 79□ 49′ 26.5″ E), *Bruguira gymnorrhiza* (7□ 30′ 45.2″ N 79□ 49′ 28.1″ E) monospecific stands and of a 17 years old *Rhizophora mucronata* plantation (7□ 51′N 79□ 81E: planting density 4x4 feet) in Pambala-Chilaw lagoon, Sri Lanka (7□30′51.6″ N 79□49′32.3″ E) in April 2012 for a belowground biomass study. The roots present in the cores were carefully extracted by washing over a 1 mm mesh, were counted as fine roots (< 5 mm diameter), medium roots (5 – 10 mm) and coarse roots (> 10 mm). The roots were then dried at 60 □C to a constant weight and were weighted to the nearest 0.01mg. The dry weight values (± SD), number of different root types (± SD) and the total number of roots (± SD) were averaged in to m^{-2} of the forest / plantation surface extrapolating the surface area of the corer. Separate Kruskal-Wallis Tests (MINITAB 14.13) were carried out to compare the mean m^{-2} values of fine roots, medium roots, coarse roots and belowground dry weight values between the different sites.

The fine root densities (number m^2) for *B. gymnorrhiza, E. agallocha, R. mucronata* natural sites and the planted *R. mucronata* site were 1463 ± 213, 1348 ± 665 1436 ± 480 and 267.8 ± 115 respectively without significant difference between the sites (Kruskal–Wallis; H = 6.38, DF = 3, p > 0.05). The fine roots are more significant in absorbing the nutrients to trees and higher densities of fine roots could be expected under higher tree densities (Kumara 2011) whilst this was not observed from the *R. mucronata* plantation. Medium root densities of 104.1 ± 34.9, 125.01 ± 14.50, 209.8 ± 50.1 and 40.53 ± 14.50 were reported respectively in sites of natural mangrove vegetation of *B. gymnorrhiza, E. agallocha, R. mucronata* and the planted *Rhizophora mucronata* sites with significant difference between sites (Kruskal–Wallis; H = 9.67, DF = 3, (p < 0.05). The plantation had the lowest medium root density compared to the natural sites. The coarse root densities (m^2) for the natural *B. gymnorrhiza, E. agallocha, R. mucronata* and the planted *R. mucronata* sites were 27.0 ± 32.4, 35.82 ± 8.21, 66.0 ± 19.9 and 30.20 ± 3.64 respectively without significantly difference between the sites (Kruskal–Wallis; H = 4.85, DF = 3, p > 0.183). The belowground sections of the larger prop-roots of *R. mucronata* could result in higher coarse root densities. However, this was not the case in the current study.

The total root densities (number m^2) of *B. gymnorrhiza,* (1594.3 ± 172.8) *E. agallocha* (1509 ± 644), *R. mucronata* (1712 ± 470) and the planted *R. mucronata* (338.6 ± 110.0) sites were without significant differences between the sites (Kruskal–Wallis; H = 6.38, DF = 3, $p > 0.05$). The belowground dry weight (g m^2) for the *B. gymnorrhiza, E. agallocha, R. mucronata* and the planted *R. mucronata* sites were 452.2 ± 77.0, 290.9 ± 101.8, 466 ± 358 and 217.08 ± 7.75 respectively without significant differences between the sites (Kruskal–Wallis; H = 6.28, DF = 3, $p > 0.05$).

Unchanged total root densities may have resulted in the unaffected dry weight between the sites. The current research thus indicates the equal importance of older mangrove plantations to natural mangroves in terms of belowground biomass production from atmospheric carbon dioxide. While the current study needs to be extended with more replicates across various Sri Lankan mangrove settings to be more conclusive, the findings of this preliminary research highlights the value of planted mangroves in the face of increased atmospheric carbon dioxide.

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