Morpho-anatomical development of mangrove trees under experimental partial burial

J. Okello, J. Kairo, F. Dahdouh-Guebas, H. Beeckman & N. Koedam
Kenya Marine and Fisheries Research Institute, Kenya and Vrije Universiteit Brussels, Belgium
judith_okello2003@yahoo.com

Mangrove forests are generally depositional sites from a geomorphological point of view. This is facilitated by the unique root structure of the trees that may trap and retain sediment while also functioning as breathing structures to help them cope with the hypoxic conditions of the habitat. The study evaluates physiognomic and anatomic response of mangroves to burial. Natural and rapid sedimentation is simulated in an experiment involving partial sediment burial of mangrove trees up to 15, 30 and 45 cm levels. The effect of the treatments on root development and bark structure of three mangrove tree species (Avicennia marina, Ceriops tagal and Rhizophora mucronata), common species along the Kenya coast and around the Indian Ocean, was then evaluated. The results showed an increase in root density over time with increased sedimentation levels, which was also linked to survival following burial particularly in C. tagal where five of the 17 buried trees died in the 45 cm sedimentation,. An increase in air lacuna diameter in the root cortex, and increased ray parenchyma and cylinder of secondary xylem widths was observed. There was also an induction of the phellogen, producing more outer tissue in the buried section of stems in all three studied species (2 fold increase in A. marina and C. tagal and 4 fold in R. mucronata). The results suggest that the observed morpho-anatomical adaptations could have resulted in better performance or recovery of biological processes in the burial-affected trees. They prove that under the circumstances studied several key mangrove species stretch their adaptation to hypoxic conditions to respond dynamically and within months to sediment-burial and he. For these species this may signify resilience to increased terrestrial sediment input.