

SUCCESSIVE CAMBIA IN THE MANGROVE *AVICENNIA*: A STUDY ON THE THREE-DIMENSIONAL STRUCTURE OF THE CAMBIA AND THE FUNCTIONING OF THE INTERNAL PHLOEM TISSUE

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Mangrove forests grow in conditions which must be considered extreme for woody angiosperms: high and changing salinity, frequent inundation with associated hypoxia, low relative humidity of the air and high temperatures. As 'marine formations', mangrove ecosystems are characteristic for the intertidal area of estuaries, creeks, sheltered bays and coastlines in tropical and sub-tropical areas worldwide. The genus *Avicennia* has been shown to be eurytopic as regards the above mentioned environmental conditions. Locally, *Avicennia* can often be found at the seaward as well as at the landward side (Disjunct zonation pattern) of the mangrove forest, sites with highly contrasting environmental conditions, while globally it has the largest latitudinal range in both the Eastern and the Western biogeographic mangrove regions (*i.e.* Indo-West Pacific and East Africa vs. America and West Africa respectively). The question is how *Avicennia* copes with this large and varying range of environmental conditions? It already has been proven that the wood anatomy of *Avicennia* is especially adapted to harsh environmental conditions. Properties of the wood (transport tissues) were suggested to be adapted to reduce cavitation events, defined as air bubble formation in the xylem sap. Inside vessels, those air bubbles can enlarge and therewith block the water transport (*i.e.* vessel embolism) so that cavitation and subsequent embolism is highly influencing the functionality of the hydraulic system. Amongst mangrove trees, the genus *Avicennia* L. (Acanthaceae) stands out by its successive cambia (*i.e.* having not one cambial layer but subsequent active cambia possibly conferring many sites of active growth in the stem). Secondary growth by successive cambia can offer *Avicennia* ecological advantages since (1) the internal phloem tissue can store water that could be used in refilling air-filled vessels with water and (2) the special, patchy growth can offer the tree woody tissue that is well-adapted to the conditions of the moment. In this study we investigate the organization of the successive cambia in *Avicennia* in three dimensions in order to complete the already investigated three dimensional network of transport tissues (phloem and xylem). Small stems (max. diameter: 3 cm) and branches of *Avicennia marina* (Forssk.) Vierh. and *A. officinalis* L. were sampled from the Rekawa lagoon in Sri Lanka, where the two species encounter spatially and temporally varying conditions as regards salinity, inundation. Serial sections and microscopic observation of the samples allow the reconstruction and visualization of the three-dimensional organization of the successive cambia. The working hypothesis of the research is: 'successive cambia are important for *Avicennia* to survive in extreme high environmental conditions and explains the genus eurytopic nature as compared to other mangrove genera'.