

Rhizophoraceae mangrove offspring, do they go or stay put? Shaped and armed for both!"

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The mangrove species from the family Rhizophoraceae have a wide distribution, combined they are pantropical. The trait vivipary is considered an adaptation that has contributed to their worldwide success. Vivipary is a unique feature of seeds germinating without a dormancy period while attached to the parent tree. The resulting mangrove seedlings elongate and form cylinder-shaped structures predominantly consisting of a hypocotyl. Upon maturity, the seedlings abruptly detach and can plant underneath the tree or embark on dispersal, which is transoceanic in exceptional cases. The direct fate of the seedling depends on the specific environmental conditions upon abscission. The seedling is a direct source to mangrove forest rejuvenation and/or range expansion. Yet, little is known about seedling anatomy and functioning during its earliest life stages, even though these stages determine the survival and potential of the seedling to become a young tree. We investigated the structure and functioning of the hypocotyl of Rhizophoraceae mangrove seedlings during three early life stages: (1) on-tree development, (2) waterborne dispersal, and (3) establishment and growth by in situ and ex situ observations and through histochemistry, CT-scan and microCT-scan approaches. Our results demonstrate the multifunctionality of the hypocotyl of young Rhizophoraceae mangrove seedlings: (1) it contributes to the carbohydrate reserves stored in the developing seedling through photosynthesis, (2) during dispersal the hypocotyl acts as a buoy and changes floating orientation due to a heterogeneous distribution of intercellular spaces along its length, and (3) upon seedling establishment, the anatomical, morphological and physiological changes in the hypocotyl indicate the gradual independence of the seedling from the hypocotyl for growth and functioning, although it maintains its importance as a water storage and transit organ. This work contributes to a holistic understanding regarding the ecological adaptation of the seedlings to the dynamic coastal area and to ocean-borne dispersal.