

Growth and structural changes of viviparous mangrove propagules: the effect of environment on dispersal and establishment

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Most true mangrove species are viviparous, meaning that their seeds germinate while still attached to the mother tree. Viviparous reproduction of plants has been linked to wet habitats, such as mangroves, however, it is not yet fully understood what the precise adaptive advantages and disadvantages of vivipary are.

We hypothesize that: (1) the advantage of vivipary is a delayed dormancy period during the (most dangerous) period for the plant between abscission and establishment, as a seedling that is less sensitive than a seed, (2) this delayed dormancy is broken by environmental cues that indicate favourable conditions to trigger root growth and establishment, (3) during establishment, longitudinal growth of the propagule, root growth and leaf development are lower in high than in low salinity conditions and higher when relative air humidity is increased.

This study was conducted in Gazi Bay, Kenya, where two viviparous mangrove species were studied: *Ceriops tagal* and *Rhizophora mucronata*. Mature propagules of both species were collected and placed horizontally on three different substrates, simulating different environmental conditions during the period between abscission and establishment (experiment A). Every six days, small sets of propagules were taken of the substrates and placed vertically in one of three hydroponic set-ups with different salinity and air humidity conditions, simulating different environmental conditions during establishment (experiment B). For both species, no length growth was observed during experiment A, and root growth was not initiated before the 13th day for which the propagules were left on one of the substrates, indicating a period of delayed dormancy and therefore supporting hypothesis 1. During experiment A, propagules that were placed on the drier substrates, dry sand and moist mud, dehydrated more than propagules placed in sea water. *R. mucronata* propagules that were more dehydrated during experiment A, started to form roots earlier than less dehydrated propagules. Therefore we hypothesize that dehydration is the environmental cue that triggers establishment of *R. mucronata* propagules. In contrast, *C. tagal* propagules that had experienced least dehydration during experiment A grew longer roots during experiment B. We hypothesize that humidity stimulates root growth of *C. tagal* propagules. These results support hypothesis 2 as drier conditions are favourable to establish for *R. mucronata* propagules that come from wetter areas and do thus have enough water stored. For *C. tagal* propagules, wetter conditions indicate favourable conditions for establishment as they come from drier areas and thus need some water to be able to establish. As was hypothesized (hypothesis 3), more length and/or root growth was observed for propagules experiencing low salinity and increased air humidity. Leaf growth was only observed for *C. tagal* propagules, of which most were treated with 50 % sea water.