

Kropotkin's Garden: networking beats competition in the struggle for limited resources (GRIN)

Initiative: Außergewöhnliches

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Projekt-Website: <https://mangroverootnetworks.info/>

Natural root grafting could play a pivotal role in resource sharing among tree networks since it can be interpreted as collaborative behaviour as known for superorganisms. It will be necessary to survey systematically under which conditions resource sharing via grafting will be beneficial for trees instead of exploiting a limited resource alone. Logistic problems hinder the latter so far, since it requires a non-destructive mapping of grafted root interaction networks (GRIN) along gradients of resource limitations, as well as the quantification of the ecological benefits at the relevant time scales of the trees. These problems will be tackled by combining studies on plant physiology, functional anatomy, and ecological modelling. Mangrove forests and water transfer are chosen as an unifying example since: (1) mangrove roots are accessible providing a relative easy way to map GRIN on stand level. (2) Gradients of salinity and subsequent water limitation develop on manageable spatial scales. (3) Preliminary studies show that the frequency of root grafts depends on these gradients. (4) The field of tree water transport is mature, helping to build up well-tested concepts of water transfer through grafts, while testing their ecological consequences. The project seeks to answer the following research questions going beyond the chosen study system: Is root grafting an adaptive strategy for coping to harsh conditions or just a *lusus naturae*, unavoidable for neighbouring plants expanding in the same rhizosphere? Is the redistribution of water among grafted trees mutually beneficial or just a parasitic behaviour? What does beneficial mean at individual level (growth rate, fitness, and survival), group level and stand level (considering that grafted and non-grafted trees together form a stand)? Do trees control their grafting so that an optimal number of connections and a favourable topology of the GRIN can be identified for a given situation of water availability?

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