

Bacterial leaf symbiosis: Evolution and function of hereditary plant symbionts

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Many plant species form highly specific associations with bacteria in the phyllosphere. These bacteria are often located inside dedicated structures visible on the leaf surface. However, how these specific associations evolved and what mechanisms are used to maintain specificity remain unclear. Using a combination of metagenome analysis from field samples and *in vivo/in vitro* experiments using a newly established model system, we show that hereditary transmission is dominant, although host switching is possible. The production of defensive specialized metabolites by the bacteria also seems to play a central role in these symbioses. Transmission relies on colonization of an enclosed space surrounding shoot meristems, while the sites of interaction between the host and symbionts are highly compartmentalized, with strict physical and chemical layers separating the partners. Separation and control of symbiont transmission by the host are likely key innovations allowing maintenance of specificity in hereditary plant symbioses.