Lotus japonicus and rhizobia interactions; from simple to complex associations

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Legume-rhizobia interactions are controlled by protein-carbohydrate recognition events that take place at the epidermal-soil interface. Legumes use LysM proteins to recognize carbohydrates produced by pathogens or symbionts. This suggests that an ancient recognition process has been used in legumes for evolution of elaborated mechanisms for various carbohydrate perceptions.

In *Lotus japonicus* two LysM receptor kinases, NFR1 and NFR5, initiate root nodule symbiosis after perception of Nod-factors secreted by *M. loti*, while EPR3 scrutinizes rhizobial exopolysaccharides controlling the elongation of infection threads. *Lotus* encodes several additional LysM receptors, and we have used reverse genetics coupled with *in planta* functional studies to study their role in *Lotus*. Our studies based on binary interactions identified novel components involved in carbohydrate signaling that contribute to the ability of *Lotus* to distinguish symbiotic and pathogenic microbes.

Recent analyses of bacterial taxa associated with roots of soil-grown *Lotus* wild-type and symbiotic mutant plants identified a previously unsuspected role of the nodulation pathway in the establishment of distinctive bacterial assemblages in root and rhizosphere. However, the role of soil microbiota on legume-*Rhizobium* symbiosis is currently unknown. We have employed specific members of a newly established culture collection to investigate the complex *Lotus*-*Rhizobium*-soil bacteria interactions in tailored microcosms. Our findings from these investigations based on plant and bacterial mutants will be presented.