Role of bacterial signal molecules in the interaction of beneficial microbes with plant hosts

Anton Hartmann [1,2,3]

[1]Helmholtz Zentrum München, Department of Environmental Sciences, Research Unit Microbe-Plant Interactions, München-Neuherberg, Germany
[2]Ludwig-Maximilians-Universität München, Faculty of Biology, Department of Microbiology and Genetics, München-Planegg, Germany
[3]Bashan Institute of Science, Auburn, Alabama, U.S.A.

Specific signaling based communication between microbes and their plant hosts are of key importance for a successful establishment of symbiotic interactions. The primary selection of microbes by the plant is directed by the innate immune system and the recognition of microbial associated molecular patterns (MAMPS). To understand the establishment of beneficial interactions of microbes with plants, it is necessary to further include diverse small microbial molecules into consideration, which modulate the primary MAMP-directed innate immune response of plants. While the description of the microbial diversity within the plant microbiome has made substantial progress, only comparably little details are understood about microbe-host interaction mechanisms. Several groups of signaling molecules are known, like a multitude of bacterial volatile substances, microbial-synthesized phytohormones and other secondary metabolites, like antibiotics. Since most bacteria communicate and organize their population activities through quorum sensing-regulating molecules, these compounds are also candidates for regulating the interaction with plants or even as interaction signals. The auto-inducing small molecules (*N*-acyl-L-homoserine lactones, AHL) of the quorum sensing activity in Gram-negative bacteria are only recently discovered signals between rhizobacteria and plants (for review see Schikora et al. 2016).

Several examples of molecular interactions through AHLs of plant-associated bacteria with their hosts will be presented. This covers the perception of pure AHL-compounds by several plants and also the modulation of interaction of beneficial rhizobacteria with plants through their production of AHLs. Of considerable practical importance are the AHL-induced priming or induction of plant resistance or the AHL-dependent interaction and colonization of diazotrophic bacteria with their hosts. Profound understanding of the multiple molecular interactions between the soil derived rhizosphere microbiome, the intrinsic plant microbiome and the plant host may provide better chances to improve plant performance by deliberately influencing the plant microbiome and plant health with beneficial microbes.

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