Nostopeptolide plays a governing role during cellular differentiation of the symbiotic cyanobacterium Nostoc punctiforme.

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Abstract

Nostoc punctiforme is a versatile cyanobacterium that can live either independently or in symbiosis with plants from distinct taxa. Chemical cues from plants and N. punctiforme were shown to stimulate or repress, respectively, the differentiation of infectious motile filaments known as hormogonia. We have used a polyketide synthase mutant that accumulates an elevated amount of hormogonia as a tool to understand the effect of secondary metabolites on cellular differentiation of N. punctiforme. Applying MALDI imaging to illustrate the reprogramming of the secondary metabolome, nostopeptolides were identified as the predominant difference in the pks2(-) mutant secretome. Subsequent differentiation assays and visualization of cell-type-specific expression of nostopeptolides via a transcriptional reporter strain provided evidence for a multifaceted role of nostopeptolides, either as an autogenic hormogonium-repressing factor or as a chemoattractant, depending on its extracellular concentration. Although nostopeptolide is constitutively expressed in the free-living state, secreted levels dynamically change before, during, and after the

hormogonium differentiation phase. The metabolite was found to be strictly down-regulated in symbiosis with Gunnera manicata and Blasia pusilla, whereas other metabolites are up-regulated, as demonstrated via MALDI imaging, suggesting plants modulate the fine-balanced cross-talk network of secondary metabolites within N. punctiforme.

Beteiligte Forschungseinheiten

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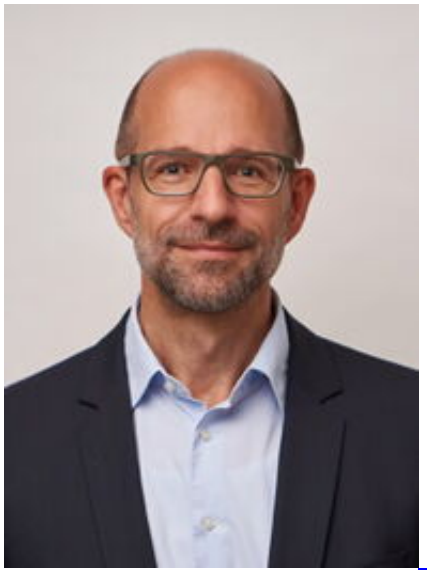

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