

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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