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Mechanisms and chemical communication underlying the biocontrol potential of cyanogenic *Pseudomonas*

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Bacteria belonging to the genus *Pseudomonas* have been shown to be extremely potent biocontrol agents. The members of this genus can protect their host plant against pathogenic organisms via different mechanisms such as induced systemic resistance, niche exclusion, and antibiosis. Antibiosis is linked to *Pseudomonas*' capabilities to produce diverse metabolites. Previously, our laboratory isolated several *Pseudomonas* strains and showed that HCN might be associated with the *in vitro* anti-*Phytophthora infestans* activity of *Pseudomonas*.

This thesis focused on different aspects of *Pseudomonas* - *P. infestans* interactions with the aim to better understand and exploit the biocontrol potential of *Pseudomonas* against *P. infestans*. We first showed that HCN is a major contributor to the volatile-mediated anti-phytophthora activity of the two tested *Pseudomonas* strains (R47 and R32) using HCN-deficient mutants.

Next, we asked whether these biocontrol strains can detect the presence of the pathogen and modulate the production of antimicrobial compounds accordingly. We demonstrated that *P. Putida* R32 upregulated its pyoverdine levels upon sensing *P. infestans* grown on an artificial medium (V8) while the production of pyoverdine was downregulated in R32 upon sensing the emitted volatiles of *P. infestans* grown on potato leaves. These results highlighted the importance of identifying biotic and chemical cues leading to modulation of plant-protective traits in biocontrol bacteria.

Finally, we also investigated the multifunctionality of one antimicrobial compound produced by some biocontrol *Pseudomonas* strains, HCN. We showed that this molecule functions as a signaling molecule for both producing and receiving bacterial cells. The absence of HCN in the producer strain led to broad physiological impacts such as reduced biofilm formation, higher swimming motility and faster growth.

Overall, this work unravels important and previously unknown aspects of the biology of *Pseudomonas* in the context of their biological control activity against plant pathogens and opens many questions related e.g. the identification of the chemical cues leading to the modulation of the antimicrobial potential of *Pseudomonas* biocontrol strains.

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