NECROROOT

Deciphering molecular interactions between tree and microorganisms: characterization of an unusual necrotic activity of a *Streptomyces* strain on tree roots

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Context —

Understanding functioning of soil microbial communities and how this influences tree health and development remain a challenge. We initiated a project to decipher the molecular dialogues between forest soil bacteria isolated from the same micro-niche and to understand how they influence tree root development. We identified a *Streptomyces*, the Bs9 strain, which strongly inhibited the development of roots and induced the production of necrotic root tissues. Anthocyanin contents in roots and leaves increased also significantly suggesting a strong stress. Interestingly, when *Streptomyces* Bs9 was co-cultivated with bacterial partners, the necrotic effect disappeared.

Objectives —

The aims of the proposed project are

- to decipher how *Streptomyces* Bs9 inhibits poplar root development,
- to understand at the molecular level how the bacterial partners prevent this effect
- to determine the specificity of the Bs9 activity toward trees and herbaceous plants.

Approaches —

To achieve these objectives, we will develop

- an analytical approach to identify the metabolite responsible for this necrotic effect and to get insights into its structure
- a genome mining approach combined with mutagenesis to identify the biosynthetic pathway of this metabolite and to determine its prevalence among forest soil *Streptomyces*
- molecular and analytical approaches to get insights on the bacterial communication within the consortium that explain the loss of this necrotic activity
- tests to determine the specificity of the necrotic effect toward other trees.

Expected results and impacts —

This project will give new knowledge on an original phenomenon of negative interaction between a forest soil *Streptomyces* strain and poplar, an economically important tree. It will also provide new insights into the interactions within soil microbial communities and how microorganisms within a community modulate the activities of their partners.

In longer term, a socio-economic impact is expected since it may lead to the discovery of a novel biomolecule with necrotic activity for application in the field of bioherbicides.