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Polychlorinated Biphenyls Degradation By Soil Microbiota Upon Stimulation Of Root Exudates

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Abstract:
Background: Rhizoremediation is a promising technology for pollutant clean-up provided by the plant holobiont, composed by the host plant and the root-associated microbiome. Through root exudation, the plant nurtures and shapes the structure and functionality of the microbial communities inhabiting the root system. The complex interactions between the plant host and the microbiome are poorly understood, in particular in contaminated environments where the pollution stress may induce specific root exudation profiles that could have a role in the activation of the microbial degrading metabolism. This is particularly relevant for highly phytotoxic and poorly degradable pollutant, like polychlorinated biphenyls (PCBs), a class of 209 recalcitrant congeners containing biphenyl with one up to ten chlorine atoms. **Objectives.** The project aims to: i) verify the changes in root chemistry upon PCBs stress; ii) sort out the time-spatial synergistic interplay within the plant holobiont components and iii) investigate the geochemistry of rhizosphere micro-niches supporting microbial degradation. **Methods**: The project spans metabolomics, bioengineering of microbial strains to generate bacterial biosensors to examine topology and dynamics of activation of the PCBs degradation pathways upon stimulation by identified plant root exudates; and the application of microsensor devices to profile the chemistry of the root microenvironments. **Results**: The project outcomes will improve the understanding of the plant holobiont system applied to environmental biotechnology, focusing on the role of root exudates to boost soil microbiome degradative potential.
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