

Biosensing and rhizosphere – endosphere geochemical microprofiling of polychlorinated biphenyls degradation by soil microbiota upon stimulation of root exudates.

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Introduction: Phyto-rhyzo-remediation is a promising technology for pollutant clean-up provided by the plant holobiont, composed by the host plant and its microbiota. Plant root exudation is modulated by the pollution stress and has a key role in the activation of the microbial degrading metabolism. Despite the well documented role of the plant holobiont in ecosystem services, the complex interactions between host and microbiome are poorly understood, in particular in contaminated environments.

Materials and Methods: The project will span metabolomics, bioengineering of microbial strains together with an original application of microsensor/sensor devices to profile the chemistry of the root microenvironments. The study will be applied to the site of Brescia-Caffaro, one of the largest sites in Europe contaminated by polychlorinated biphenyls (PCBs).

Results: The project aims to sort out the time-spatial synergistic interplay within the plant holobiont components and the geochemistry of rhizosphere micro-niches supporting microbial degradation. The research will combine the: i) set up and application of bacterial biosensors to examine topology and dynamics of activation of the PCB degradation pathways upon stimulation by identified plant root exudates; and ii) sensing the plant modulated chemical micro-habitats through microsensor/sensor devices during plant-microbe interaction under PCBs stress.

Conclusions: The project outcomes will provide a comprehensive understanding of the plant holobiont applied to environmental biotechnology, focusing on the the role of root exudates as boost of soil microbiome degradative potential.

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