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Abstract

Session 1.8 – Phytoremediation of polluted soil and air

Title:

“ENDEGRADE” – Endophytic bacteria for improving phytoremediation

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Phytoremediation of polluted soils is often constrained by toxic levels of organic pollutants, as well as their breakdown products. This can often result in impaired remediation capacity, or death, of the plant. “ENDEGRADE”, a European Union-funded, multidisciplinary research project, is addressing these problems in a unique way. Our aim is to identify the bacteria found within the plant xylem sap (endophytes) of plants used in phytoremediation applications that are capable of degrading key pollutants. Bacteria with inherent degradative potential will be selected, or degradation genes will be introduced by natural gene transfer, into strains that efficiently colonise the plants. Re-inoculated plants will be tested for enhanced degradation of pollutants, transported from the roots to the leaves, thus reducing phytotoxicity and volatilisation. In this way, the efficacy and regulatory appeal of phytoremediation can be improved as *in situ* degradation is increased and off site losses are reduced (Patent Applied For¹).

Poplar (*Populus trichocarpa x deltoides* var. Hoogvorst/Hazendans) and Willow (*Salix alba*) trees were studied, as they represent model plants for phytoremediation, due to their perennial nature, fast transpiration and growth rates and deep rooting. Xylem sap was extracted aseptically from stems and the endophytic bacterial community studied. The xylem sap was used as an inoculum for enrichment cultivation, the isolates were characterised genotypically and selected strains were screened for their ability to degrade organic pollutants. Additionally, 16S rRNA genes of the total endophytic bacterial community were amplified by PCR of community DNA extracted from the xylem sap and the community structure was analysed by DNA fingerprinting and sequencing. This work quantifies the diversity of endophytic bacteria associated with phytoremediation plants. It is anticipated that further basic understanding of their diversity, movement, ecophysiology and metabolism will lead to novel and improved phytoremediation of contaminated land.

¹ US Patent No 60/291,344. D. Van der Lelie, S. D’Haene, D.N. Dowling, U. Karlson, E.R.B. Moore, S. Taghavi, S.A.J. Trapp, J. Vangronsveld. "Method for improving phytoremediation treatment of a contaminated medium". Application U.S. Patent office, 16 May, 2001.