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Bioaugmentation for the treatment of pesticides polluted soils: selection of carrier materials for microbial biofilm formation and inoculation in soil

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Abstract : The use of pesticides in agriculture can lead to soil and groundwater contamination due to the migration of pesticides and their metabolites through soil. The addition of pesticide-degrading microorganisms to top soil, via a bioaugmentation process, is a green way to reduce pesticides contamination without soil excavation or chemicals addition. The efficiency of bioaugmentation approaches is closely linked to the viability and survival of the microorganisms once in soil. Inoculants viability into soil can be increased when inoculant are introduced as microbial biofilms grown on carrier materials. In the frame of BIOPEPS and EPURSOL projects, various carrier materials for biofilm development were tested for their ability to favor the growth and activity of pesticide (MCPA)-degrading bacterial consortia. Various carrier materials (zeolite, pozzolana, oyster shell) as natural or modified (modification of surface properties) materials were put in contact with a selected microbial planktonic consortium capable of MCPA biodegradation. The biodiversity and MCPA biodegradation activity of the various biocomposites (biofilm + carrier material) were evaluated. T-RFLP and High-throughput sequencing on the 16S rRNA genes suggested that modifying the surface of carrier material influenced bacterial diversity as well as MCPA degrading activity. Growth as biofilm allowed higher activity than growth as planktonic state. This suggests that taking into account the nature of the carrier material should improve the efficiency of bioaugmentation process for bioremediation purposes.

Keywords: Bioaugmentation, pesticides, carrier materials

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