Title: FUNGAL BIOREMEDIATION OF HERBICIDES

Authors Pereira, P.H.F.[1], Carvalho, M.[1], Direito, I.N.C.[2], Macrae, A.[1]

Institution [1]Laboratório de Biotecnologia Sustentável e de Bioinformática Microbiana, Programa de Pós-graduação em Biotecnologia Vegetal e Bioprocessos, Centro de Ciências da Saúde, Universidade Federal do Rio de Janeiro (UFRJ); [2]Universidade Estadual da Zona Oeste

Abstract:

Fungi, especially the lignolytic species, are recognized for their ability to degrade aromatic compounds. However, the use of microorganisms for *in situ* bioremediation has several challenges. One challenge is the development of formulations that deliver and maintain the active ingredients/ microbes into the envirnoment. In this study, the pesticide 2,4-dichlorophenoxyacetic acid (2,4-D) was used as a model herbicide and a collection of fungi were screened to detect 2,4-D degrading strains. An *Aspergillus awamori* strain was selected with this characteristic. High Performance Liquid Chromatography (HPLC) was used to analyze samples from fungal incubations to confirm degradation. A total of three formulations were developed using the *Aspergillus awamori* strain and three more with a positive control strain *P. crysosporium* ATCC ® ME-446. Starch, wood and sodium polyacrylate mixes were used as substrates. An ahaplic plano soil,with gritty texture, was used to generate a soil extract agar to test formulations. This medium was used to simulate different matric potentials and to compare the radial growth rate of the fungi ($mm.day^{-1}$). Formulations were stored in the laboratory on the shelf at temps that varied between 15-35°C for 400 days and viability tests conducted every 20 days. *P. crysosporium* strains remained viable for 200 days but a decline was observed after the 100^{th} day. Scanning electron microscopy (SEM) of the formulations depict hyphae and spores and show clear evidence that the fungi colonize the formulations. The SEM image of the starch-based formulation with *A. awamori* shows hyphae, spores and conidia. Preliminary results of the radial growth experiments on soil agar comparing the formulae with growing fungal plugs reveal no significant difference in growth rates between *P.chrysosporium* formulations and fresh plugs grown on malt extract agar. No significant effect on *Setaria viridis* growth (a C4 model plant) was detected with *P. crysosporium.* Preliminary results show that the overall influence on plant growth is minimal or non-existent, which is expected from an ideal inoculant. The biodegradation efficiency of the formulations in soil contaminated with 2,4-D is now being tested. This project aims to develop fungal innoculants that are able to degrade pollutants and so far, the results are encouraging.

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