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Influence of two polycyclic aromatic hydrocarbons on spore germination, and phytoremediation
potential of *Gigaspora margarita*-*Echinochloa polystachya* symbiosis in benzo[a]pyrene-
polluted substrate

Revista Internacional de Contaminación Ambiental, vol. 22, núm. 1, 2006, pp. 39-47
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Available in: <http://www.redalyc.org/articulo.oa?id=37022104>

Abstract

Arbuscular mycorrhizal fungi (AMF) are ubiquitous microorganisms that occur in contaminated soils. However, little is known about the responses of AMF with organic contaminants such as polycyclic aromatic hydrocarbons (PAH). The first objective of this study was to evaluate the influence of two PAH on spore germination of *Gigaspora margarita* Becker & Hall. Water-agar plates were contaminated with phenanthrene (PHE) and benzo[a]pyrene (BaP) at several concentrations: 0, 25 (0.1 mM BaP & 0.15 mM PHE), 50 (0.2 mM BaP & 0.3 mM PHE), 75 (0.3 mM BaP & 0.45 mM PHE), and 100 $\mu\text{g mL}^{-1}$ (0.4 mM BaP & 0.6 mM PHE), respectively. The second objective consisted on the evaluation of the responses of the symbiosis between *G. margarita* and *Echinochloa polystachya* (H.B.K.) Hitch. to increased concentrations of BaP (0, 25 (0.1 mM), 50 (0.2 mM), 75 (0.3 mM), and 100 mg kg^{-1} (0.4 mM) under plant growth chamber conditions. Spore germination and hyphal length were drastically reduced by PHE. Reduction of spore germination was higher than 90% in presence of PHE. In presence of BaP, spore germination reduction was 42.8% when exposed at 100 $\mu\text{g mL}^{-1}$ (0.4 mM). Spores that germinated in presence of 75 (0.3 mM) and 100 (0.4 mM) $\mu\text{g BaP mL}^{-1}$ had greater hyphal elongation. BaP did not affect shoot dry mass of non-mycorrhizal or mycorrhizal *E. polystachya*. Mycorrhizal plants showed higher dehydrogenase activity in the rhizosphere soil at 0, 0.2 and 0.3 mM BaP, but reduced root polyphenol oxidase activity at 0 and 0.1 and higher at 0.3 mM BaP than non-mycorrhizal plants. Dissipation of BaP was higher in non-mycorrhizal plants than mycorrhizal plants. *Echinochloa polystachya* showed an intrinsic capability on dissipating PAH from its rhizosphere.

Keywords

arbuscular mycorrhizal fungi, PAH, rhizosphere.