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Biodegradation of phenol in static cultures by Penicillium chrysogenum ERK1: catalytic abilities and residual phytotoxicity.

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Abstract

A phenol-degrading fungus was isolated from crop soils. Molecular characterization (using internal transcribed spacer, translation elongation factor and beta-tubulin gene sequences) and biochemical characterization allowed to identify the fungal strain as Penicillium chrysogenum Thom ERK1. Phenol degradation was tested at 25 degrees C under resting mycelium conditions at 6, 30, 60, 200, 350 and 400 mg/l of phenol as the only source of carbon and energy. The time required for complete phenol degradation increased at different initial phenol concentrations. Maximum specific degradation rate (0.89978 mg of phenol/day/mg of dry weight) was obtained at 200 mg/l. Biomass yield decreased at initial phenol concentrations above 60 mg/l. Catechol was identified as an intermediate metabolite by HPLC analysis and catechol dioxygenase activity was detected in plate assays, suggesting that phenol metabolism could occur via ortho fission of catechol. Wheat seeds were used as phytotoxicity indicators of phenol degradation products. It was found that these products were not phytotoxic for wheat but highly phytotoxic for phenol. The high specific degradation rates obtained under resting mycelium conditions are considered relevant for practical applications of this fungus in soil decontamination processes.

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