POTENTIAL OF MARINE MICROBIAL CONSORTIA IN THE BIOREMEDIATION OF ENVIRONMENTAL POLLUTANTS

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Abstract:

The high industrial activity causes several environmental problems, mainly due to the discharge of wastes. Marine environments are susceptible to contamination by industrial waste and also may represent a target niche for microbial prospecting. Marine microorganisms are adapted to saline conditions and have potential for being used in many biotechnological processes. Bioremediation is a promising approach for the degradation of environmental pollutants using the metabolic potential of microorganisms. The aim of this study was to evaluate the potential of marine microbial consortia to detoxify and degrade environmental pollutants such as RBBR textile dye, Benzo[a]pirene (BaP) and Diesel oil. Microbial consortia were structured in eight different combinations using four ligninolytic fungi from marine environments and two bacteria from petroleum reservoir (off-shore), previously selected based on their capacity to produce enzymes and to degrade hydrocarbons. Erlenmeyer flasks containing 50 mL of mineral medium, the microbial consortium and the pollutant (RBBR 500 ppm, BaP 1 mg/50mL and Diesel oil 1% v/v) were kept in incubators for 7 days at 140 rpm and 28 °C. Ligninolytic enzymes (Lac, MnP, LiP) were quantified and the samples were submitted to toxicity analysis using *Artemia* sp. Consortia 5 and 7 showed presenting discoloration of RBBR dye up to 55 and 62%, and a low rate of mycelial adsorption (8 and 20%, respectively). Enzymatic production of laccase was up to 160 U/L for consortium 8. LiP and MnP were produced in low levels for all consortia. Studies with BaP showed up to 68 U/L of MnP production (consortium 6). Laccase production reached 53 U/L for consortium 4 and LiP was produced at low levels for all samples. Samples containing diesel oil presented production of MnP up to 114 U/L. RBBR and BaP control (mineral medium+pollutant) showed low toxicity for *Artemia* sp. Assay 7 with RBBR, and 4, 5, 6 and 7 with BaP demonstrated the same pattern of low toxicity. Samples with diesel oil showed no detoxification. Data from the present study highlighted the ability of marine consortia to produce ligninolytic enzymes in the presence of pollutants and showed promising results in the field of textile dye discoloration, encouraging further studies. Different concentrations of BaP and a longer period of incubation and/or a lower concentration of diesel oil will be tested, since these compounds are highly complex.

Keywords: Marine microbial consortia, Environmental pollutants, Ligninolytic enzymes, Bioremediation, Toxicity

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