

**TITLE:** OPTIMIZATION OF DEGRADATION OF CREOSOTE AND POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) BY BIOAUGMENTATION AND BIOSTIMULATION APPROACHES

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**ABSTRACT:**

Creosote consists predominantly of polycyclic aromatic hydrocarbons (PAHs) and about 20-40% of these contaminants correspond to the 16 PAHs considered as priority pollutants by environmental agencies due to their immunotoxic and carcinogenic properties. This makes these contaminated areas essential to remediation. In this work we evaluated bacteria isolated from sediment samples from a lagoon contaminated with creosote and located in an old sleepers treatment plant area in the municipality of João Neiva-ES, regarding its ability to degrade the contaminant to formulate a consortium capable of promoting the area bioremediation. Forty-three bacteria were isolated by enrichment technique in three successive cultures of seven days in mineral medium (MM) with creosote (10% v/v). The isolates were cultured in MM with creosote (0.25% v/v) and evaluated for the removal of contaminants. The isolates with the highest degradation rates (fifteen isolates) were evaluated in degradation assays using as substrate sediment from the study area, added 1% (v/m) creosote, in order to select the ones that would form the inoculant. The microcosmos experiments were assembled in 500 mL Schott bottles containing 300 g of 0.25% (v/m) creosote contaminated sediments using a complete factorial 2<sup>4</sup> design, varying the factors aeration, nutrients and presence of the autochthonous microbiota or the consortium addition, to simulate biostimulation and/or bioaugmentation approaches. The bottles were incubated for up to 60 days at 30°C. The consortium selected considering the highest PAHs and creosote degradation rates was composed by *Stenotrophomonas maltophilia* LAPER27, *Comamonas terrigena* 3FM8, *Springobacterium* sp. 5FM2, *Pseudomonas* sp. 3C10M3, *Bacillus* sp. 2FM2, LAPM39 and LAPER93 and *Enterobacter* sp. 4FM2. In general, there was a significant effect of the addition of consortium, presence of the autochthonous microbiota and the interaction between consortium\*autochthonous microbiota\*aeration. The degradation rates varied from 54 to 97% and the highest values were achieved for the treatments with consortium. Additionally, in the last 20-days of assay, the aeration associated to nutrients addition promoted increases on the rate degradation, too. The data show that the consortium was effective in creosote degradation in conditions simulating contaminated sediment and this information will be useful for future *in situ* application of the bioremediation technology.

**Key Words:** Bioaugmentation, biostimulation, bacterial inoculant, PAHs, creosote.

**Development Agency:** Fapemig, Prpq, CAPES, CNPq.