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MICROFAUNA AND MICROALGAE COMMUNITIES FROM ACTIVATED SLUDGE SYSTEMS: COMPOSITION AND STRUCTURE VARIATION IN RESPONSE TO TANNERY EFFLUENT TREATMENT

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Non-treated tannery effluents represent a great risk from the environment due to its high polluting potential. One alternative for their correct treatment is the application of bioaugmentation (BA) with activated sludge. This strategy requires a permanent monitoring of the microorganism communities that constitute it to verify its adequate functioning. Thus, the objective of this study was to evaluate the changes in the composition and structure of the microfauna and microalgae communities present in both tannery effluent (E) and activated sludge (AS) samples, before and after applying the treatment. For this purpose, field mesocosms assays were carried out using containers with 10 L of effluent, inoculated with previously generated activated sludge (1% v/v) (BA) under optimal conditions, or uninoculated effluent (C) as controls. The containers were oxygenated by bubblers and exposed to natural environmental conditions. At the beginning (T0) and at 5 and 10 days (T5 and T10), samples were taken to identify the communities at the genus or species level, determining both abundance and taxonomic richness.

It was observed that the microfauna community was constituted by 5 functional groups (swimming, crawling and sessile ciliates, large flagellates and naked amoebae) and 8 genera, in samples of E and AS, both controls and treated. In the E samples it was observed that in both C and BA, the group with the highest abundance was swimming ciliates (mainly represented by *Tetrahymena* sp.) and it was followed by large flagellates (mainly by *Peranema* sp.). While in the AS samples, these functional groups decreased in abundance and the group of naked amoebae significantly increased. Regarding the taxonomic richness at the genus level, it was observed that in the E samples the values decreased at T10, both in C and BA, while in the AS no variation was observed in this parameter over experimental time. On the other hand, 4 functional groups (Cyanophyta, Chlorophyta, Euglenophyta and Bacillariophyta) and 17 genera were observed in the microalgae community, which varied depending on whether they were E or AS samples. In the E samples it was determined that in both treatments, the most abundant group was Cyanophyta (represented mainly by *Aphanocapsa delicatissima* at T0 and *Anabaena* sp. at T5 and T10), while in the AS samples this group decreased and Euglenophyta (constituted mainly by *Euglena* sp.) increased. Regarding the taxonomic richness analyzed at genus and species level, it was observed that in both samples the values decreased in T5 and even more in T10, both in the C and BA conditions.

The microfauna characterization carried out allowed establishing that the applied activated sludge system is in the initial stage of operation. On the other hand, the obtained data on the microalgae community are a novel contribution of great importance due to the lack of previous descriptions on their presence in activated sludge systems.

BB15

REMOVAL OF POLYCYCLIC AROMATIC COMPOUNDS BY *Pseudomonas* sp. P26 IN AN IMMOBILIZED SYSTEM ON ORGANIC WASTE AS CULTURE AND SUPPORT MEDIUM. INFLUENCE OF BIOSTIMULATION WITH INORGANIC PHOSPHATE

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Microbial immobilization is a beneficial strategy that can ensure greater efficiency and persistence of microorganisms used in petroleum compound biodegradation processes. Natural organic supports for immobilizing microbial cells are cost-effective, biocompatible and biodegradable. Particularly, walnut shell is a hydrophilic, porous support with high wear resistance. The study objectives were: 1) to evaluate the immobilization of *Pseudomonas* sp. P26, an environmental bacterium that removes aromatic petroleum compounds, using walnut shell and a low-cost culture medium, and 2) to determine the removal of a mixture of dibenzothiophene (DBT) and polycyclic aromatic hydrocarbons (PAHs) by the immobilized system and planktonic cells, in the presence and absence of an inorganic biostimulant (KH_2PO_4). *Pseudomonas* sp. P26 was pre-cultured in LBm broth (24 h, 30°C, 180 rpm) and immobilized in bioreactors containing ground walnut shell (support) and a previously formulated low-cost culture medium (2.5% corn maceration water and 1% crude glycerol). This system was incubated at 30°C for 72 hours without agitation. Viable cultivable cell counts were performed, and metabolic activity was determined using the thiazolyl blue tetrazolium bromide (MTT) reduction technique to MTT-formazan. The removal of a mixture of PAHs (DBT, acenaphthene, fluoranthene, and pyrene; 0.2 mM each) by the immobilized system and control planktonic cultures was determined in JPP broth, with different concentrations of KH_2PO_4 (0 and 0.46%), after 7 days of incubation at 30°C and 100 rpm. Accumulation of inorganic polyphosphate (polyP) was determined by the colorimetric method of acid hydrolysis and subsequent reaction with phosphomolybdate in the presence of ferrous sulfate. Bioemulsifying activity was assessed by the non-polar solvent mechanical agitation method, and the remaining concentration of contaminants was measured using reverse-phase high-performance liquid chromatography. The results of metabolic activity (15% conversion to MTT-formazan) and bacterial viability (1.9×10^7 CFU/g support) indicated that *Pseudomonas* sp. P26 was effectively immobilized in walnut shells using the formulated culture medium with industrial by-products. The highest removal percentages of DBT (33%), fluoranthene (23%), and pyrene (25%) were observed in the immobilized system compared to planktonic cells. The presence of inorganic phosphate did not significantly affect contaminant removal or bioemulsifying activity in both immobilized and planktonic cultures, while the highest intracellular accumulation of polyP was evidenced in planktonic cultures. The obtained results demonstrate that walnut shells, corn maceration water, and crude glycerol are organic waste materials that can enhance bacterial immobilization systems to be applied in the transformation of petroleum compounds in bioremediation or refining technologies.

BB16

ENHANCED WASTEWATER TREATMENT USING CONSTRUCTED WETLANDS WITH ELECTRICAL ENERGY APPLICATION

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Recently, the application of electro-active bacteria in constructed wetlands for wastewater (WW) treatment has gained attention (Bioelectrochemical Wetlands-BW). These systems consist of a shallow vessel filled with porous material and two layers of conductive material forming electrodes. Electro-active bacteria interact with these electrodes using them as electron acceptors (anode) and donors (cathode) for their