



WASTEWATER TREATMENT WITH MICROORGANISMS ASSOCIATED TO THE GREEN COFFEE BEANS IMMOBILIZED IN POLYURETHANE FOAM

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Introduction. In 2010, it was reported that only 44% of total municipal wastewaters were treated in Mexico (1). The remaining untreated wastewater has been an environmental problem for a long time. Researching teams have concentrated their attention in the enhancement of conventional wastewater treatments such as activated sludge process, aerated lagoon, anaerobic digestion and so forth. Recent investigations have shown that microorganisms associated with green coffee beans (MAGB) are able to remove contaminants from aquatic and terrestrial systems (2, 3). In this research, these microorganisms were immobilized in polyurethane foam (PUF) and applied for the treatment of a particular wastewater coming from the CINEVESTAV-IPN's sewage.

Methods. The wastewater was collected from CINVESTAV-IPN's sewage and preserved at -10°C. Microorganisms were obtained from green coffee beans (2). *Immobilization:* 0.5 g of PUF cubes (1 cm³) were added to 100 ml of wastewater and autoclaved. Afterward, 4 ml of 5 × 10⁶ spores/ml solution were incorporated (4) and incubated at 28°C with 120 rpm. Incubation was carried out at three different times (24, 72 and 144 h). *Treatments:* Inoculum growth at different times was immobilized in 3 PUF cubes and assayed under no sterile wastewater-inoculated cubes (W-IC) and sterile wastewater-inoculated cubes (SW-UIC). Culture's controls were prepared for sterile wastewater-non inoculated cubes (SW-UIC) and wastewater-non inoculated cubes (W-UIC). Culture conditions were kept at 28°C for 120 h in 40 ml of wastewater adjusted at pH 5.5 with 0.1 N HCl at 120 rpm. *The chemical oxygen demand (COD)* was measured according to the method APHA 5220 B (5).

Results. Treatments W-IC and W-UIC at 24 (Figure 1) and 72 h reached a removal over 80% in wastewater with 465 mg DQO/L. However, an increase of COD in wastewater (796 mgCOD/L) produced inferior removal by native microorganisms against the removal achieved for MAGB (80%) (Table 1).

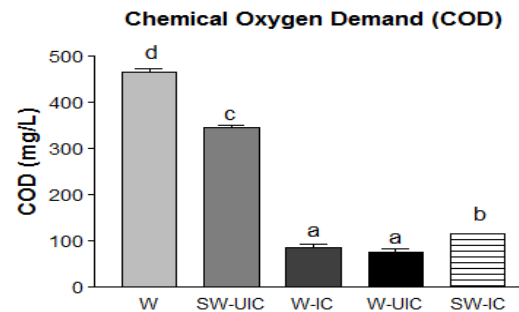


Fig.1- 24 h of inoculum. W - Wastewater with 465 mg COD/L. same letters indicate no significant difference.

Table 1. Percentage COD removal. treatments at different times of inoculum. (1) wastewater with 465mg COD/L. (2) wastewater with 796mg COD/L.

Treatment	COD REMOVAL (%)			
	24 h ⁽¹⁾	72 h ⁽¹⁾	144 h ⁽¹⁾	144 h ⁽²⁾
SW-UIC	25.33	20.31	24.13	16.74
W-IC	81.72	86.02	86.50	81.66
W-UIC	83.87	80.76	68.58	60.60
SW-IC	75.27	45.64	33.93	84.03

Conclusions. The present study reveals that MAGB are unaffected by the presence of native microorganisms being able to reach a major removal rate of COD in comparison with those with only native microorganism, particularly in the experiments with higher COD.

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