



TREATMENT OF PETROLEUM-CONTAMINATED SOILS WITH COFFEE HUSK

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Introduction. Due to different natural and human causes, the petroleum's infrastructure is frequently subject to disasters and environmental contingencies along the different stages of the petroleum lifecycle and its derivatives. Bioremediation is used to reduce the environmental impacts, to detoxify the contaminants in different environments by using microorganisms, plants, etc, or with strategic composting systems or enzymatic treatments (1). The use of agro-industrial wastes as coffee husk (3) could be a solution to diminish the hydrocarbons. The objective of this study was to remove the total petroleum hydrocarbons (TPH) by using a residue of coffee that could improve the texture, as well as an increased water retention that could be of benefit to enhance the hydrocarbonoclastic growth.

Methods. An experimental system was used with 100 g of petroleum-contaminated soil from Coatzacoalcos, Ver., a homogeneous microcosm was used by mixing soil with coffee husk as follows: 100:0, 98:2, 96:4, 94:6 and 92:8. Samples were incubated at 28 °C during 30 days. An aeration system was used, also an airflow of 8 L/min was applied for 10 minutes every three days. The measured variables were determined in triplicates according to the normativity (2, 5): TPH, nitrogen, phosphorus, organic matter and total count of bacteria and fungi,

Results. The initial TPH concentration was of 117109 ppm, its value exceeded the maximum permissible according to NOM. At the end of treatment, it was obtained a 70% removal treatment by using 2% of coffee husk, this result is not reported previously. The pH value was observed in neutral conditions (6-7.5) in all experiments, the microorganisms growth was observed. Humidity and organic matter were increasing during the time. In Table 1 are shown the values of CO₂ production, N, and P with the selected treatment.

Table.1 Characterization of the mixture of soil and coffee husk

Soil-coffee husk	TPH	P (ppm)	N (%)	CO ₂ (mg)
98-2	6975	12.4	0.015	46.64

In Table 2 are shown the values of the final removal after 30 days of treatment, it is observed that the coffee husk is a material with an added value that could be applied in contaminated soils, even though some residues like cane bagasse or orange peel had been proposed in other studies (4).

Table 2 Removal of Total Petroleum Hydrocarbons in the systems

	98-2	96-4	94-6	92-8
TPH (ppm)	33295	71523	48093	67207
Removal percentage (%)	71.57	38.92	58.93	42.61

Conclusions. The proposed treatment with coffee husk is an alternative to reduce the polluted soils. The used conditions of the biological process were very important to accelerate the bioremediation. Ventilation could be controlled to enhance the removal. Finally, the addition of 2% of coffee husk is recommended in future studies.

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