BIODEGRADATION OF THE AROMATIC FRACTION OF CRUDE MAYA BY A *Serratia marcescens* STRAIN

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Introduction: In the past years, bioremediation studies have been made with the aim of restoring soils contaminated with petroleum and its derivatives. However, it has been demonstrated that the fraction of lower biodegradability is the fraction constituted of poly aromatic hydrocarbons. (PAH´s)**.** Poly aromatic hydrocarbons are organic pollutants of great interest due to their persistence in the environment and their harmful roles to living beings such as mutagens and carcinogens (ASTDR. (2002). A number of studies focus on the metabolic routes of bacteria capable of degrading numerous poly aromatic hydrocarbons (Zheng *et al;* 2011). In this project the biodegradation of the aromatic fraction (ARF) by *Serratia marcescens* strains was studied.

Materials y methods: In order to obtain the aromatic fractions of the crude maya petroleum fractioning was carried out using solvents of different polarities (Machin *et al;* 2008). Acclimatization of the white SM4 *Serratia marcescens* strain was done during 4 weeks. The SM4 strain was grown in mineral medium and glycerol as the carbon source, after 3 days 150ppm of ARF was added. Subsequently, in the second week of acclimatization the second addition of 150 ppm de ARF was added. Biodegradation of the aromatic fraction by *Serratia marcescens* was realized in 125ml shaking flasks with 50 ml of mineral medium and 15 ppm of the aliphatic fraction (ALF). The cultures were inoculated with 10% of the SM4 strain and incubated at 150 rpm at 30 ^{O}C during 4 days. The ARF and ALF extraction were realized with dichloromethane. The Samples were extracted using the modified EPA 418.1 technique (EPA 1991). Sample extracts (1µl) were injected and analyzed in gas chromatograph Hewlett-Packard Mod. 55890 equipped with a flame ionization detector (FID), and a rubber capillary column of HP-Methy-silicon.Helium was used as gas carrier with a flow of 29 ml min.

Results: the percentage of the fractions obtained from crude maya petroleum were asphalts, 17; aliphatics, 21; aromatics, 34; resins (not acidic) 15 and 11% of resins weakly acidic. Due to the toxicity of the aromatic fraction observed during the alclimatization, 10 % of the alphatic fraction was used to favor the ARF biodegradation. The results of biodegradation was a mixture of ARF and ALF by the white *Serratia marcescens* SM4 strain are presented in figure 1. A significant difference was observed in the profile obtained at the end of the 4 days when compared to the control.

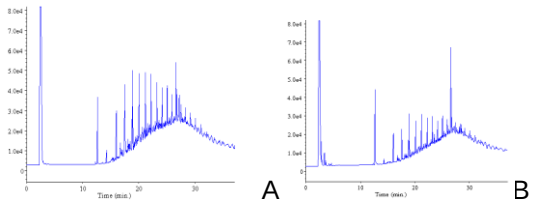

Figura 1. Biodegradation of the aromatica and aliphatic fraction of crude maya petroleum. A) chromatogrphic profile control and B) final chromatigraphic profile with *Serratia marcescens* after 5 days.

Conclusions: Under these conditions the White SM4was able to degrade 45% of the aromatic and aliphatic fraction.

References: 1. ASTDR. (2002) Department of Health and Human Services Toxicological profile for polycyclic aromatic hydrocarbons (HAPs). Atlanta, USA. **2.** GA,U.S. **2.**Zheng C; He J; Wang Y; Wang M; Huang Z. (2011) Hydrocarbon degradation and bioemulsifier production by thermophilic *Geobacillus pallidus* strains. Bioresource Technology 102: 9155–916. **3.** Machin-Ramirez C, Okoh AI, Morales D, Mayolo-Deloisa K, Quintero R, Trejo-Hernandez MR (2008) Slurry-phase biodegradation of weathered oily sludge waste. Chemosphere 70 (4):737-744. **4.** EPA,1991. Petroleum Hydrocarbons, total ecoverable. Method 418.1 .US Storet No. 45501. Cirrus Environmental 2.0,4/23/91,USA,pp.1-9.