



BIOREMEDIATION OF SOIL CONTAMINATED WITH HYDROCARBONS USING BAGASSE OIL PALM

Clara Ivonne Ruiz Reyes; Oswaldo Guzmán López; Adriana Hernández Ordaz; Luis Felipe Sánchez Díaz; María del Carmen Cuevas Díaz; Facultad de Ciencias Químicas; Universidad Veracruzana campus Coatzacoalcos CP 96538, clara.ruizr@hotmail.com

Key word; Bioremediation, agro-industrial waste, contaminated soil

Introduction. The alternative of adding agro-industrial waste in soil bioremediation processes has reduced costs and it is also a feasible improvement to the environment (1). These residues have the function of improving the characteristics of the soils and are considered as low density materials that can improve the physical, chemical and biological characteristics of soil (2). In this study, the use of bagasse oil palm (*Elaeis guineensis*) could increase the porosity of soil, it could enhance the oxygen diffusion which favors microbial activity, soil stability and structure to deal(3); however it is not known in what proportions should be added to contaminated soil.

Methods. A system of bioremediation in micro-scale (100 g) using different mixtures of contaminated soil and palm oil bagasse was placed in with ratios of 100:0, 98:2, 96:4 and 92:8. Respective controls in the treatments were employed. To ensure reliability of the results, three replicates were used. The treatments were incubated at 28 ° C, aeration subjecting every third day with an air flow of 8 L/min. Experiments were carried out during 30 days. The response variables were the total petroleum hydrocarbons (TPH), CO₂ production (4) and total count of bacteria and fungi .

Results. The initial concentration of TPH in soil was 117109.7 ppm exceeds the limit set in the standard (%), while the palm bagasse was found high in nutrients N and P.

The treatment with a greater percentage of removal was the 96:4 (fig.1) with a 56% relative to the initial concentration in terms of pH 6-7, and with moisture content of 60% and 55 mg of CO₂ and this itself increased presence of microorganisms.

Table 1. Physicochemical parameters observed during the kinetics in 96:4.

	HTP's ppm	P (%)	N(%)	CO ₂ (mg)
Initial Soils	117109.701	0.710	0.0392	-----
Bagasse		5.22	0.21	-----
94-6				
30 días	50616.93	4.089	0.032	59.48

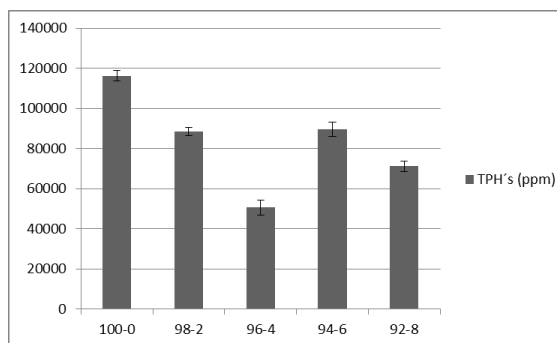


Fig.1 . TPH's in a kinetic of 30 days (ppm).

Conclusions. The addition of bagasse palm to oil contaminated soils is an alternative for bioremediation. The best treatment decreased proposed TPHs concentration at (56%) in contaminated soil is using 6% of palm residue.

Acknowledgements. This work was financed by PROMEP.

References.

1. Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). 2010. Contaminación y remediación anual de sitios afectados por emergencias ambientales. Base de datos estadísticos del Sistema Nacional de Información Ambiental y Recursos Naturales (SNIARN).
2. Cuevas-Díaz, M.; Rojas-Avelizapa, N.; Pogyvaraldo, H.; Esparza-García, F.; Rodríguez-Vázquez, R. (2005). Remoción de hidrocarburos totales de petróleo utilizando cultivo sólido. XVI Congreso Chileno de Ingeniería Química
3. Antonio-Ordaz, J., Martínez-Toledo, A. Ramos-Morales, R.F., Sánchez-Díaz, L. F., Martínez, A. J., Tenorio-López, J.A., Cuevas-Díaz, M.C. 2011. Biorremediación de un suelo contaminado con petróleo mediante el empleo de bagazo de caña con diferentes tamaños de partícula. Multiciencias. 11(2):136-145. ISSN 1317-2255 Arbitrada, indizada en OEI-CREDI y REDALYC, Venezuela
- 4.- Rochette P. y Hutchinson, G.L. "Measurement of soil respiration in situ: chamber techniques," en Hatfield, J. y Baker, J.M. eds., Micrometeorology in Agricultural Systems, Monografía ASA , nº 47, pp. 247-286. American Society of Agronomy, 2005. Madison, WI.
- 5.- SEMARNAT (2003). Norma Oficial Mexicana NOM-138-SEMARNAT/SS-2003 Límites máximos permisibles de hidrocarburos en suelo y las especificaciones para su caracterización y remediación. Diario Oficial de la Federación 29 de Marzo de 2005.