REVISTA AIDIS

de Ingeniería
y Ciencias Ambientales:

Investigación, desarrollo y práctica.

Vol. 7, No. 2
6 de agosto de 2014

http://www.journals.unam.mx/index.php/aidis/index

ISSN 0718-378X

Con el patrocinio de:

INSTITUTO DE INGENIERÍA UNAM

Foto: Alejandro Vargas Casillas
Sistema experimental de microalga-bacteria para tratamiento de agua residual

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales: Investigación, desarrollo y práctica.

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La Revista AIDIS de Ingeniería y Ciencias Ambientales. Investigación, desarrollo y práctica, es una publicación electrónica cuatrimestral, coeditada por AIDIS y el Instituto de Ingeniería UNAM, que publica contribuciones evaluadas por pares originales, de calidad y actualidad, dentro de su área de competencia. De esta forma se presentan trabajos que abarcan aspectos relacionados con el conocimiento científico y práctico, tanto tecnológico como de gestión, dentro del área de la Ingeniería Sanitaria y Ambiental en Latinoamérica.

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Cada edición muestra los trabajos que derivan del arbitraje académico de carácter internacional. También se publican números especiales de trabajos destacados que fueron presentados en los diversos Congresos Interamericanos realizados por la Asociación Interamericana de Ingeniería Sanitaria y Ambiental (AIDIS) y que en forma adicional fueron sometidos al proceso de revisión interno de la Revista AIDIS. La Revista AIDIS está indizada en Latindex 2006 y en Periódica (DGB-UNAM).

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La Revista AIDIS de Ingeniería y Ciencias Ambientales. Investigación, desarrollo y práctica es una publicación electrónica cuatrimestral, editada en el Instituto de Ingeniería, UNAM. Editor responsable: Germán Buitrón Mendez. Reservas de derechos al uso exclusivo
04-2011-011413271800-203

ISSN
0718-378X

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ISSN 0718-378X

Directorio

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2
6 de agosto de 2014

Tabla de Contenido

Vol. 7, No 2.

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2
6 de agosto de 2014

Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 78 – 86
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

EMPLAZAMIENTO DE ESTACIONES DE TRANSFERENCIA DE RESIDUOS SÓLIDOS URBANOS EMPLEANDO HERRAMIENTAS SIG: UN CASO DE ESTUDIO

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LOCATION OF URBAN SOLID WASTE TRANSFER STATION USING GIS TOOLS: A CASE STUDY

Recibido el 2 de septiembre de 2013; Aceptado el 13 de mayo de 2014

Abstract

Currently the trend growth of cities and the distant location of disposal sites on generating areas, require the use of transfer stations to streamline the system of solid waste collection. The location of facilities requires extensive knowledge of the study area, since its location must be suitable, being as close as possible to the areas to be served. In this context, this paper uses the method of moments to locate a transfer station in the municipality of Santa María Huatulco. The Geographic Information Systems (GIS) tools are used looking for feasible áreas using additional aspects than purely geographical. The methodology used within the municipality limits of Santa María Huatulco, helped to identify a polygon inside which contained the feasible area for the installation of the transfer station. Finally, field visits were made to identify the specific location of the sites. found three potential sites for the location of the transfer station, so we used a matrix tool for evaluation of the sites located.

Key Words: Geographic Information Systems, Transfer Station, Urban Solid Waste.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 87 – 94
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

EVALUACION DE LA EFICIENCIA DEL SISTEMA FENTON SOBRE LAS AGUAS RESIDUALES DE LA PLANTA MOSCAFRUT

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EVALUATION OF FENTON SYSTEM EFFICIENCY ON THE WASTEWATER OF MOSCAFRUT PLANT

Recibido el 2 de septiembre de 2013; Aceptado el 14 de mayo de 2014

Abstract

The industrial sector in recent years has expanded and developed rapidly which has led to a proportional growth of wastewater. Given the importance of search management strategies for these waters, this work was evaluated at laboratory scale application of an advanced chemical oxidation treatment "Fenton System" Waste Water Plant Breeding and Sterilization of Flies Fruit and parasitoids (MOSCAFRUT). The waters were treated separately as water and process service, and the mixture of both, developing tests with different concentrations of hydrogen peroxide and ferrous sulfate. Preliminary results and process water mixture were analyzed by two-factor under 3 * 3, service water, because they presented removal efficiencies of 100%, it was necessary to apply the fix. Optimal concentrations and treatment for waters were mixed 29498 ppm H2O2, FeSO4 6000 ppm, and 23598 ppm H2O2, FeSO4 6000 ppm, for service water, with a reaction time of 90 minutes. The physicochemical properties were assessed before and after treatment, where removal efficiencies were obtained from 90 to 100% for COD, 90% for total suspended solids, 73% for biochemical oxygen demand (BOD5), 68% for total nitrogen, 74% to 87% and total phosphorus to fats. Microbiological analysis performed post treatment to water indicated the presence of microorganisms is zero.

Key words: Advanced Oxidation Process, Organic Matter, Wastewater.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 95 – 104
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

DIAGNÓSTICO DE LA CONTAMINACIÓN POR METALES PESADOS EN SEDIMENTO SUPERFICIAL DE LA LAGUNA DE TÉRMINOS, CAMPECHE: UNA APROXIMACIÓN ESTADÍSTICA

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DIAGNOSIS OF HEAVY METAL POLLUTION IN SURFACE SEDIMENT OF TERMINOS LAGOON, CAMPECHE: A STATISTICAL APPROACH

Recibido el 2 de septiembre de 2013; Aceptado el 28 de mayo de 2014

Abstract

The levels of heavy metals in sediments of Terminos Lagoon, one of the largest coastal lagoons and of great ecological importance of Mexico, were evaluated; the analysis of heavy metals included geochemical approaches (normalization) and multivariate statistics. Sediment samples were collected at 45 sites in October 2010; digestion was accomplished according to the 3050B method of the Environmental Protection Agency of the United States and quantification was performed by inductively coupled plasma mass spectrometry. Additionally, organic matter content and particle size distribution were determined. The heavy metal concentrations found in this study are relatively low and similar to those reported previously. The spatial distribution of several of the metals analyzed here is probably influenced by the rivers discharge, especially for B, Ba, Co, Mn, Ni and Zn. Significant positive correlations between elements used as normalizers (organic matter content, silt and Fe) indicated that concentrations of most metals analyzed here can be explained by natural biogeochemical processes, except As and Mg. Principal Component Analysis indicated that some of the stations near of the Atasta lagoon mouth, Chumpán River and Palizada River, have higher concentrations ranges in comparison to the local background and therefore are considered vulnerable sites to heavy metal pollution.

Key Words: coastal lagoon, heavy metal, sediment.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 105 – 114
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

PRESENCIA DE ANTI-INFLAMATORIOS NO ESTEROIDEOS EN CUERPOS DE AGUA SUPERFICIAL DE TAPACHULA, CHIAPAS, MÉXICO

PRESENCE OF ANTI-INFLAMMATORY DRUGS IN SURFACE WATERS OF TAPACHULA CHIAPAS, MEXICO

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Recibido el 2 de septiembre de 2013; Aceptado el 28 de mayo de 2014

Abstract

This study investigated the presence of three non-steroidal anti-inflammatory drugs (NSAIDs: naproxen [NPX], ketoprofen [KFN] and ibuprofen [IBF]), in surface water bodies receiving mostly untreated sewage from the city of Tapachula (South Mexico). Samples were taken during three sampling campaigns from two rivers (Coatán and Texcuyuapan), one urban stream (Coatancito), and one coastal lagoon (Barra San Simón), and the samples were analyzed by gas chromatography-mass spectrometry. Results showed high concentrations of NPX (17.83-142.50 µg L^{-1}), KFN (5.30-67.87 µg L^{-1}) and IBF (3.97-31.30 µg L^{-1}), present in most samples. Correlation analysis between target compounds and physicochemical parameters supported the view that sewage discharge is the main source of these pollutants. Furthermore, estimated hazard indexes suggested a potential threat to aquatic organisms (algae, daphnids and fish) due to high concentrations of NPX and IBF in surface water.

Key Words: Developing community, Emerging contaminants, Hazard index, Developing countries.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 115 – 124
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

DIGESTIÓN ANAEROBIA DE RESIDUOS HORTOFRUTÍCOLAS POR VÍA MESOFÍLICA A ESCALA DE LABORATORIO

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ANAEROBIC DIGESTION OF FRUIT AND VEGETABLE WASTE BY MESOPHILIC VIA LABORATORY SCALE

Recibido el 2 de septiembre de 2013; Aceptado el 28 de mayo de 2014

Abstract

The objective of this study was to assess the biological methane potential (*BMP*) of different fruit and vegetable waste and mixtures thereof in anaerobic biodegradability tests. Physicochemical studies were done to allow performing formulations of substrate:inóculo in a relation of 3 gCOD: 1.5 gTVS for a conventional anaerobic digestion. Substrates *BMP* values and their corresponding biodegradabilities were obtained for banana, papaya, mango and mix vegetables, in terms of $mLCH_4/gCOD_{Total}$ and percentages were as follows: 255, 313, 341 and 341; 76, 89, 97, and 97%, respectively. Subsequently, mixtures of aforementioned substrates were analyzed which did not show significant differences in methane production in comparison of individual substrates.

Key Words: Anaerobic digestion, biodegradability, *BMP.*

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 125 – 133
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

POTENCIAL BIOQUÍMICO DE METANO EN LA CO-DIGESTIÓN ANAEROBIA DE ESTIÉRCOL PORCINO, CON RESIDUOS AGROINDUSTRIALES, EN REACTORES POR LOTE

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BIOCHEMICAL METHANE POTENTIAL IN THE ANAEROBIC CO-DIGESTION OF PIGMANURE, WITH AGROINDUSTRIAL WASTES, IN BATCH REACTORS

Recibido el 2 de septiembre de 2013; Aceptado el 28 de mayo de 2014

Abstract

The biochemical methane potential (BMP) in the anaerobic co-digestion of pig manure (EP) with Ataulfo mango (MA) wastes and crude glycerin (GC) in batch bioreactors was evaluated in mesophilic conditions. The bioreactors were operated with anaerobic sludge (1-1.5gSTV/g) as inoculum and an organic load of 3-3.5 gCOD/g (30%MA/70%EP and 5%GC/95%EP), a control with 100%EP and a blank with inoculum without substrate. The kinetics for methane production were followed during 40 days obtaining 246 $mLCH_4/gDQO$ and 340 $mLCH_4/gDQO$ for the 30%MA/70%EP and 5%GC/95%EP treatments, respectively. In contrast, a low methane yield production of 178 $mLCH_4/gDQO$ was obtained with 100%EP. The addition of EP and MA wastes and GC favored the process stability, enabling the production of methane gas was carried out without the addition of alkaline substances. Therefore, the mixture of EP with agroindustrial wastes (MA and GC) in anaerobic co-digestion is an alternative to enhance methane production compared with EP anaerobic digestion alone.

Key Words: co-digestion, methane, wastes.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 134 – 140
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

DEGRADACIÓN ELECTROQUIMICA DE ANTICONCEPTIVOS ORALES EN MEDIO ACUOSO

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ELECTROCHEMICAL OXIDATION OF ORAL CONTRACEPTIVES IN AQUEOUS MEDIUM

Recibido el 2 de septiembre de 2013; Aceptado el 12 de junio de 2014

Abstract

Because of the risk that emerging contaminants pose to both human health and the environment, various treatments have been evaluated to achieve degradation. Advanced Oxidation Processes, including anodic oxidation represent a technically feasible and valuable for the treatment of these contaminants alternative. Preliminary results from the anodic oxidation of an oral contraceptive (ethinylestradiol - gestodene) are presented herein . The tests were carried out in an electrochemical cell not divided 50 mL reaction volume. As anode and cathode electrodes of boron-doped diamond, parallel arranged two cm apart were used. The efficiency of the anodic oxidation was evaluated under different values of current intensity and concentration of supporting electrolyte (Na2SO4). The tests were carried out according to a 3x3 factorial design. The levels of the first factor, current, were 100, 200 and 300 mA. The three levels of the second factor, supporting electrolyte concentration, were 0.02, 0.05 and 0.1 M. The variance analysis allowed us to observe that the efficiency of the system was controlled by the current intensity ($p < 0.001$). The electrolyte concentration showed no significant difference ($p = 0.85$) nor interaction occurred between the two factors evaluated ($p = 0.272$). Under the best conditions found (200 mA induced current and 0.02 M Na2SO4), maximum removal of 89.9% of initial COD concentration of 700 mg L-1 was achieved. The results presented to the anodic oxidation as a technically viable approach to treatment of oral contraceptives (mixture of estrogens) such as ethinylestradiol, gestodene alternative mixture.

Keywords: Emerging Contaminants, Degradation of oral contraceptives, estrogens, process electrochemical advanced oxidation.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 141 – 153
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

LOCALIZACIÓN DE UN SITIO PARA CONSTRUIR UN CENTRO DE APROVECHAMIENTO DE RESIDUOS SÓLIDOS URBANOS A TRAVÉS DE TRES MÉTODOS

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LOCATION OF A SITE APPROPRIATE FOR BUILDING A WASTE MANAGEMENT CENTER URBAN SOLID BY THREE METHODS

Recibido el 2 de septiembre de 2013; Aceptado el 12 de junio de 2014

Abstract

Milpa Alta, is a section of Mexico City, was studied to determine the location of an area with technical and regulations conditions in order to build a Waste Management Center Urban Solid (WMC), integrated with a compost plant and a plant of waste separation. In the research, technical criteria related to economic indicators, social, public and topographical services were considered. Besides, indicators linked with environmental criteria regulated by normativity were also considered. To select the most suitable place, Methods of Moments (MM), Geographic Information Systems (GIS) and Multi-criteria Analysis (MA) were used. Therefore, with theoretical basis probable places that comply with the demand criteria by the environmental normativity were located. The first two Methods allowed determine the suitable places to build the WMC; such information was corroborated in field by means of the MA which allows determining the best location.

Key words: Geographic Information Systems, Method of Moments, Multi-criteria Analysis, solid waste.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 154 – 160
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

ANÁLISIS DE LA EFICIENCIA DEL SISTEMA ACOPLADO FLOTACIÓN POR AIRE DISUELTO (FAD)-FENTON EN EL TRATAMIENTO DE AGUA RESIDUAL PROVENIENTE DEL PROCESO DE EXTRACCIÓN DE ACEITE DE PALMA.

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ANALYSIS OF COUPLED SYSTEM EFFICIENCY DISSOLVED AIR FLOTATION (DAF) - FENTON IN WASTEWATER TREATMENT PROCESS FROM PALM OIL EXTRACTION

Recibido el 2 de septiembre de 2013; Aceptado el 12 de junio de 2014

Abstract

The steady growth of the population and industrial sector demand large volumes of water in their processing of resources, it causes daily generated huge amounts of wastewater. The system Dissolved Air Flotation (DAF) coupled to a Fenton system emerges as a proposal for the treatment of industrial effluents from the process of extracting palm oil. Thereby achieving optimize and reduce both the time and the area for treatment. FAD system was operated with 4.5 atm pressure, retention time 30 min and concentration of 8 g / L of total solids (ST). Clear phase recovered was oxidized by Fenton system using 100 mL per reactor under an arrangement bifactorial (H2O2/Mn+2) 5 x 5. The five H2O2 concentrations used in this design were 3000, 4500, 6000, 7500 y 9000 mg/L and the manganous sulphate concentrations tested were 1000, 1500, 2000, 2500 y 3000. Under de best conditions was achieved up to 100% removal of suspended solids (SS), 79.81% total solids (TS), 93.44% Chemical Oxygen Demand (COD) and 95.17% fats and oils (G & A).

Keywords: Advanced oxidation processes, Chemical oxygen demand, Wastewater treatment.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 161 – 169
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

TRATAMIENTO QUÍMICO DE AGUA CONTAMINADA CON PARATIÓN METÍLICO POR MEDIO DE LA REACCIÓN DE OXIDACIÓN FENTON

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CHEMICAL TREATMENT OF WATER CONTAMINATED WITH METHYL PARATHION BY FENTON OXIDATION REACTION

Recibido el 2 de septiembre de 2013; Aceptado el 12 de junio de 2014

Abstract

In this study, we evaluated the efficiency of the dark Fenton reaction to treat agricultural effluents contaminated with the pesticide methyl parathion. For this purpose, different concentrations of H2O2 and Fe2+were tested. The experiments were carried out in batches and consisted of four treatments, each with a different pesticide: H2O2: Fe2+ ratio (1:4:0.1, 1:4:1, 1:4:10, 1:0.4:1). The chemical oxygen demand (COD), determined by the closed reflux colorimetric method, was monitored with time to assess the degree of oxidation achieved. The residual H2O2 was measured by the colorimetric method using ammonium metavandate catalyst. Finally, the removal of the active ingredient was evaluated by analysis of the molecule with a gas chromatograph Clarus 500 (Perkin Elmer) equipped with both an electron capture detector and a flame ionization detector (GC-ECD/FID). It was found that the reagents proportion of 1:4:1 (pesticide: H2O2: Fe +2) led to a high COD removal from the effluent. Methyl parathion was rapidly degraded within 10 min via the Fenton reaction. Removal of the active ingredient (ai) was almost complete (>98%) and the COD removal obtained after treating an aqueous solution of the commercial product (1000 mg COD / L and 2100 mg ai / L) was superior to 90%.

Keywords: Fenton, Methyl Parathion, Pesticide, Wastewater.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 170 – 178
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

EVALUACIÓN DE LA REMOCIÓN DE CARGA ORGÁNICA EN LIXIVIADOS MADUROS MEDIANTE UN SISTEMA ACOPLADO: COAGULACIÓN-FLOCULACIÓN-OXIDACIÓN ANÓDICA

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EVALUATION OF THE REMOVAL OF MATURE LEACHATE ORGANIC CHARGE BY A COUPLED SYSTEM: COAGULATION-FLOCCULATION-ANODIC OXIDATION

Recibido el 2 de septiembre de 2013; Aceptado el 18 de junio de 2014

Abstract

In this work, we evaluated the removal of organic matter measured as COD contained in mature leachate from the landfill to Tuxtla Gutierrez, Chiapas, Mexico, based geographically in 16 ° 39 'north latitude and 0.819 ° 12'0 .85 93 west longitude, with an average elevation of 960msnm. With the application of a coupled system. As a first step we applied the coagulation-flocculation process to different pH values (7, 6 and 5) using as a coagulating solution FeCl3 2.2 g L-1, fast and slow mixing were performed at 250 rpm for 80 seconds and 30 rpm for 20 minutes, respectively. The best treatment obtained was subjected to the anodic oxidation step using boron-doped diamond (BDD) electrodes at different current intensities (CI) 100, 200 and 300 mA and at pH 3, 5 and 7. The oxidation time was three hours. The higher COD removal (48%) was achieved at pH 5. Anodic oxidation on the best treatment (pH = 3, CI = 300 mA) reached a COD removal of 83%, resulting in a 90% overall removal with the application of the coupled system and increased biodegradability by 69.5% (0.16 to 0.23).

Key Words: Anodic oxidation, Coagulation-Flocculation, mature leachate.

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Revista AIDIS de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica. ISSN 0718-378X

Vol. 7, No. 2, 179 – 188
6 de agosto de 2014

REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

EXPOSICIÓN A PLAGUICIDAS EN NIÑOS DE LA ZONA PLATANERA DEL SOCONUSCO, CHIAPAS

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EXPOSITION TO PESTICIDES IN CHILDREN FROM BANANA ZONE SOCONUSCO, CHIAPAS

Recibido el 2 de septiembre de 2013; Aceptado el 26 de junio de 2014

Abstract

The organochlorine (OC) pesticides like DDT were widely used in Mexico in agriculture and malaria control. We analyzed by GC-MS, 201 plasma samples of children from 4 communities from banana zone Soconusco. Of 28 compounds tested was determined exposure to DDE, DDT and lindane. An interesting finding was that after 10 years that DDT was banned in Mexico, detected levels reveal that the child populations of banana Soconusco area are exposed to this compound. The DDE was detected in 92.6% of the samples, the DDT and lindane in the 64.7% and 70% of samples respectively. The community of Miguel Aleman, presented the highest levels of exposure to DDE, DDT and lindane, with values 15457 ng/g Lipid, 3213.8 ng/g Lipid and 1596.4 ng/g Lipid, respectively. The exposure determined in the communities from banana zone Soconusco are similar to those of malaria endemic areas in Mexico, where agriculture is also practiced. Lindane exposure in children is a reflection of the widespread use of this compound for the control of head lice and scabies among populations. In recent years, we take become aware of the threats to health and environment by the indiscriminate use of toxic chemicals, particularly those of synthetic origin and require longer times for degradation. Therefore it is necessary to conduct investigations to determine the risk of exposure and to determine the effects made by these compounds.

Key Words: Children, DDT, exposition, lindane, Soconusco.

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