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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.

El enfoque es interdisciplinario buscando contribuir en forma directa a la generación de conocimiento, al desarrollo de tecnologías y a un mejor desempeño profesional. Entre los temas cubiertos por la revista están los siguientes: agua potable, calidad de agua, aguas residuales, residuos sólidos, energía, contaminación, reciclaje, cambio climático, salud ambiental, nuevas tecnologías, ética, legislación y política ambiental, gestión ambiental, gestión de empresas de servicios de saneamiento, sustentabilidad y participación social, entre otros.

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BENEFICIOS AMBIENTALES DERIVADOS DE LA CAPTACIÓN DE AGUA DE LLUVIA EN TANQUES ELEVADOS Y OPTIMIZACIÓN DEL TAMAÑO DE LOS TANQUES

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*ENVIRONMENTAL BENEFITS ARISING FROM RAINWATER
CATCHMENT IN ELEVATED TANKS AND SIZE
OPTIMIZATION FOR THE TANKS*

Recibido el 14 de agosto de 2013; Aceptado el 11 de abril de 2014

Abstract

This research proposed a simulation of the operation of a system of rainwater harvesting (SAALL) for a set of five buildings of an academic institution covering an area of 8202.15 m² and three storey (11.7 m) located northeast of Mexico City between Ticomán and Zacatenco. To estimate the volume of rainwater that can be used, was considered the use of historical data records from a weather station located in San Juan de Aragón for the period 1991-2010. We considered the use of rainwater within 16 urinals and 49 toilets that operating with flushometer with a minimum pressure equal to 98.1 kPa and for cleaning floors in set of five buildings. The savings of potable water and electricity to store the water collected in tanks to water supply in toilets could be possible by leveraging potential energy so the use of electricity and potable water is preserved. The results showed that could save 3943.38 m³/year water and 3194.35 kWh/year. We underline the importance of capturing and harnessing rainwater for expose as a viable and attractive option for local governments and private investment, proving that is possible get both environmental and economic benefits to replace the potable uses and non potables of water with rainwater.

Key Words: Elevated tanks, rainwater, rainwater harvesting potential, water balance, water demand.

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EFFECTO DE BORDE; RUIDO, MATERIA ORGÁNICA EN SUELO Y CONTAMINANTES PERSISTENTES EN LAS ÁREAS NATURALES PROTEGIDAS DE CALAKMUL-BALAMKÚ, CAMPECHE

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*ROAD EDGE EFFECT; NOISE, ORGANIC MATTER IN SOILS
AND PERSISTENT POLLUTANTS IN NATURAL
PROTECTED AREAS IN CALAKMUL-BALAMK, CAMPECHE*

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

Abstract

In this paper, the road edge effect caused by vehicular traffic of the road located in the Natural Protected Area Balamkú-Calakmul in the state of Campeche is studied. The indicators organic matter, heavy metals, polycyclic aromatic hydrocarbons and noise were quantified at different perpendicular distances to the Bat Cave, as key geographical site. The masic flow of lead emissions is 2.08 ton year⁻¹, 1.54 Ton yr⁻¹ of zinc and 1.63 Ton year⁻¹ of polycyclic aromatic hydrocarbons. Even though these concentrations might be the result of atmospheric dilution these substances have persistent and highly toxic properties. Monitoring results of indicators, note evidence of the road edge effect, since the values of organic matter, heavy metals and polycyclic hydrocarbons exhibit a downward pattern with increasing distance. Likewise, the disturbing level of traffic noise can reach 0.5 to 1 km in radial area, with concentrations of 40 dB and a background noise of 20 dB.

Key Words: impact on natural protected area, organic matter in soils, road edge effect.

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APLICACIÓN DEL NOPAL (*Opuntia ficus indica*) COMO COAGULANTE PRIMARIO DE AGUAS RESIDUALES

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APPLICATION OF NOPAL (*Opuntia ficus indica*) AS
PRIMARY COAGULANT WASTEWATER

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

Abstract

The primary treatment of wastewaters represents a viable alternative for the reuse of these waters in irrigation where precipitation is low or there is lack of water, since the obtained water quality is suitable at a reduced price. In this work the performance of the powered Mexican prickly cactus (*Opuntia ficus indica*) as primary coagulant for wastewater was evaluated using jar tests. Wastewaters tested came from the sewage system of the Azcapotzalco campus of the Autonomous Metropolitan University, in Mexico City. Their main characteristics were: pH between 6.8 and 7.1, initial chemical oxygen demand (COD) between 198 and 215 mg/L, total coliforms of 5.1×10^6 FCU/100 mL and turbidity between 289 and 367 NTU. Applied concentrations of prickly cactus powder were between 10 and 70 mg/L, and mixing and resting times of 3 min at 150 rpm, and 30min, respectively. Turbidity was reduced up to 65-92%. Total coliforms were reduced in 3 Log, however, this parameter would need a posterior disinfection treatment, since the maximum allowance in Mexican regulation was not met. COD was reduced up to 37.9%.

Keywords: Opuntia, prickly cactus powder, primary coagulant, wastewater reuse.

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REVISTA AIDIS

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EVALUACION PRELIMINAR DE ACTIVADORES BIOLOGICOS PARA EL COMPOSTAJE DE RESIDUOS DE TOMATE

* Patricia Martínez-Nieto¹
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Claudia Vargas-Vargas²

*PRELIMINARY EVALUATION OF BIOLOGICAL
ACTIVATORS FOR TOMATO WASTE COMPOSTING*

Recibido el 3 de diciembre de 2013; Aceptado el 19 de junio de 2014

Abstract

Compost activators are microorganisms and nutrients mixtures primarily used to speed up the decomposition of organic, agricultural and industrial wastes and to enhance the biological and nutritional fertilizers quality. This research tested fermented herbal preparations (FHP), native beneficial microbiota captured in rice (NBMR) and cellulolytic, proteolytic and amylolytic microorganisms (CPAM) as biological inoculants added to tomato waste composting in order to evaluate its performance in the degradation of these wastes and fertilizers quality. The shortest degradation was observed with CPAM (78 days), followed by MNBA and FHP (84 days) and finally the uninoculated control (91 days). All fertilizers meet current standards, except the treatment NBMR regarding phytotoxicity test (61%), which had an average value lower than required by international standards ($\geq 90\%$). Although the nutrients concentrations, except boron, were higher in compost with biological activators, there were no significant differences between inoculated and uninoculated compost at $P < 0.05$. Biological inoculants showed to be effective decreasing the composting degradation time of organic material and increasing nutrient content relative to uninoculated compost; however, it is important to continue optimizing the doses to obtain significant results for the improvement of the obtained fertilizers nutritional quality.

Key Words: Biological activators, fermented herbal preparations, microbial inocula.

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MÉTODO ECONÓMICO DE REMOCIÓN DE ARSÉNICO EN AGUAS PARA COMUNIDADES RURALES

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*ECONOMIC METHOD OF REMOVAL OF ARSENIC IN
WATER FOR RURAL COMMUNITIES*

Recibido el 3 de diciembre de 2012; Aceptado el 19 de junio de 2014

Abstract

We found the ability to remove arsenic using filtration technology with Green Sand, in several experimental conditions, in samples of synthetic and underground water in the provinces of Santa Fe and Santiago del Estero, Argentina. The removal efficiency was found 96.3% for arsenic concentrations ranging between 0.038 and 0.608 mg/L, achieving the mantle filter retain 9.72 mg of arsenic per liter of Green Sand. The optimum flow of filtering for cross-section of the prototype tested was 0.50 L/min, it could be obtained in 8 hours of daily operational 240 L of water with arsenic concentrations not risky to health. This study represents an effective alternative, it does not require sophisticated technological development, it is low-cost, easy implementation, uses no electrical energy and complies with the recommendations of reference of arsenic in water for human consumption.

Key words: water for human consumption, rural communities, Green Sand, removal of arsenic.

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VALIDAÇÃO DO MÉTODO ANALÍTICO PARA DETECÇÃO DE SAXITOXINAS (STX E dc-SXT) POR CROMATOGRAFIA LÍQUIDA DE ALTA EFICIÊNCIA COM DETECTOR DE FLUORESCÊNCIA E DERIVATIZAÇÃO PRÉ-COLUNA

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VALIDATION OF AN ANALYTICAL METHOD FOR SAXITOXIN DETECTION (STX AND dc-STX) BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY WITH FLUORESCENCE DETECTOR AND PRE-COLUMN DERIVATION

Recibido el 28 de enero de 2014; Aceptado el 11 de septiembre de 2014

Abstract

The method of reversed-phase high-performance liquid chromatography with fluorescence detection (HPLC- FLD) and pre-column derivation was validated for the detection and quantification of saxitoxin (STX) and decarbamoil - saxitoxin (dcSTX) provided from an axenic strain of *Cylindrospermopsis raciborskii*. The previously mentioned validation was performed in order to give credibility to analytical method. To that end, it was used parameters, such as selectivity, linearity, limit of detection (LOD), limit of quantification (LOQ), accuracy, precision and robustness to ensure the quality of the method. The results showed good selectivity, demonstrating that the method had the ability to measure the toxins in an array even in the presence of other components. The linearity presented a correlation coefficient (r) greater than 0.999 for STX and dc- STX in a working range of 4.5 to 150 mg L⁻¹ for STX and 3.0 to 132 mg L⁻¹ to dcSTX, showing that the method has the capacity to deliver results directly proportional to the concentration of detected analyte. The method's sensitivity was measured by LOD and LOQ, obtaining satisfactory results for the type of analysis performed. As permitted by the legislation, the method obtained a good precision and accuracy for the toxins studied at different levels of concentration and also proved robust, since it was insensitive to small variations that could occur during the analysis.

Key Words: HPLC, Saxitoxins, Analytical method validation.

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PROPOSIÇÃO DE SISTEMA DE APROVEITAMENTO DE ÁGUA DE CHUVA PARA UMA INSTITUIÇÃO DE ENSINO NA REGIÃO NORDESTE DO BRASIL: ESTUDO DA VIABILIDADE ECONÔMICA

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PROPOSAL FOR RAINWATER HARVESTING SYSTEM FOR
A SCHOLAR INSTITUTE IN NORTHEAST REGION OF
BRAZIL: A STUDY OF THE ECONOMIC VIABILITY

Recibido el 6 de febrero de 2014; Aceptado el 4 de noviembre de 2014

Abstract

The expectation of drinking water shortage for the next years has been a motivating factor to search for alternatives to supply the demand of future generations, to promote rational use of water and to reduce its waste. Once water is directly linked to people's maintenance and quality of life, and also compromise all living species in our planet, it is imperative that the entire civil, business and industrial societies, as well as the government and its public institutions, to seek mechanism to preserve it. In this context, this paper aimed to propose a system of rainwater usage for Campina Grande campus of the Federal Institute of Education, Science and Technology of Paraíba – IFPB, and analyze the economic viability of its establishment. To meet the increasing demand of water, we considered the rainfall in the region, and the potential to capture rainwater in that campus, which has been designed in a reservoir of 787 m³, the method Rippl. The proposed system aims at supplying 94% of non-potable consumption of that campus, which will provide a savings of 84% of water purchased from the Water Company of Paraíba - Cagepa, and based on the tools of financial mathematics, represents a relationship benefit /cost of 2.52 with Capital Return Period of 9.83 years. Therefore, the economic viability of the rainwater harvesting system implementation was proved and it showed to be attractive, especially when it requires a very high demand of water with less noble purposes, as it is the case.

Key words: economic viability, rainwater harvesting, water usages.

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REVISTA AIDIS

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AVALIAÇÃO DA TOXICIDADE EM EFLUENTES DE FOSSA SÉPTICA PARA *Daphnia magna* E *Daphnia similis*

*Geisa Vieira Vasconcelos Magalhães¹
Edlene Sales de Paula¹
Ronaldo Stefanutti¹

EVALUATION OF TOXICITY OF SEPTIC TANK EFFLUENT
TO *Daphnia magna* AND *Daphnia similis*

Recibido el 6 de febrero de 2014; Aceptado el 11 de noviembre de 2014

Abstract

Sustainability in sanitation management is not an option but a necessity. The direct discharge of untreated wastewater has a negative environmental impact and poses health problems for society. One source of pollution is the effluent from septic tanks that may pollute the aquatic biota is dumped directly into waterways without any treatment. And to assess the impact that these pollutants have on aquatic biota is used for toxicity testing. The aim of this study was to know the characteristics of the effluent from septic tanks and assess the degree of acute toxicity via microcrustaceans *Daphnia magna* and *Daphnia similis*. Were collected and characterized twelve samples of effluent from septic tanks. Later there was the toxicity of the samples with *Daphnia magna* and *Daphnia similis* microorganisms. The results indicate varying concentrations of COD, BOD, solids and nitrogen. Toxicity tests demonstrate the presence of high toxicity for all samples with a mean EC₅₀ equal to 54% to 41% *Daphnia magna* and *Daphnia similis* showing that these samples are considered toxic. Toxicity tests with aquatic organisms are an effective tool for evaluation or detection of the effects of pollutants on living organisms.

Key Words: *Daphnia magna*, *Daphnia similis*, Effluent from septic tanks

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ADSORÇÃO DO CORANTE INDOSOL AZUL TURQUESA EM CONCHAS DE MARISCOS *Brachidontes solisianus* CALCINADAS

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ADSORPTION OF BLUE TURQUOISE INDOSOL DYE IN
CALCINED *Brachidontes solisianus* SHELLS

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Abstract

Synthetic dyes are among the most harmful chemicals found in various industrial activities. The textile sector has a special feature for generating large volumes of wastewater containing in its composition this class of substances, which, when not properly treated, can cause serious contamination of water bodies. Due to such environmental implications, new technologies have been pursued to catch these compounds. Among these processes, adsorption finds great industrial application because it is associated with low costs and high removal efficiency. The material was characterized by XRD and BET. A 2³ factorial design where the best conditions were evaluated within the studied variables was performed: mass (g), particle size (mesh) and agitation (rpm). The kinetic study was done using the best conditions presented in the experimental design 0.1 g of the adsorbent with a particle size of 60 mesh at a constant agitation of 300 rpm. The efficiency of this process was above 99 % which shows that seafood is a good adsorbent

Key Words: adsorption, textil dye, shell.

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REVISTA AIDIS

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ESTUDOS INICIAIS PARA USO DO ÍNDICE TRIX PARA ANÁLISE DO NÍVEL DE EUTROFIZAÇÃO NO ESTUÁRIO DO RIO POTENGI – NATAL – RN - BRASIL

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*INITIAL STUDIES TO USE THE INDEX TRIX FOR ANALYSIS
OF EUTROPHICATION IN ESTUARY POTENGI RIVER -
NATAL – RN – BRAZIL*

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Abstract

This study tested the applicability of the trophic index (TRIX) to assess the level of eutrophication in the course of the river Potengi located in the metropolitan region of Natal - RN - Brazil. The choice of this method was due to its multiparametric nature and also for having developed and enhanced a model to process eutrophication in different coastal environments. The Potengi river receives the discharge of pollutants from loads of different sources, especially the direct release of untreated sewage and industrial effluents involving a considerable source of nutrients and eutrophication, with direct consequences on the increased productivity of its estuary. 13 points of the estuary were analyzed at two different times according to the changing of tide of the Potengi. The results indicated that the levels of eutrophication ranged from mesotrophic to eutrophic according to the TRIX index, with the worse situation in the rainy season, a result due to the drag of pollutants brought by rains from the watershed into the estuary of the river. We conclude that application of the TRIX index was valid for the evaluation of trophic status along the estuary of the river Potengi and the results indicate the need for greater control on the entry of pollutants loads to the watershed, especially with the expansion of services collection and treatment of household and industrial waste in the metropolitan region of Natal - RN.

Key Words: Eutrophication, TRIX, estuary, River Potengi, Brazil.

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AVALIAÇÃO DOS IMPACTOS AMBIENTAIS DO USO E OCUPAÇÃO DO SOLO NAS ÁREAS DE PRESERVAÇÃO PERMANENTE - APP DE DUAS LAGOAS URBANAS

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*ENVIRONMENTAL IMPACTS EVALUATION OF USE AND
OCCUPATION OF LAND IN THE PERMANENT
PRESERVATION AREA - PPA OF TWO URBAN LAGOONS*

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Abstract

This research has like main objective the Environmental Impact Evaluation of the use and occupation of the land in Permanent Preservation Areas – PPA of two urban lagoons, through the preparation and analysis of thematic maps created using Geographic Information System - GIS. The preparation of the maps was performed using ArcGIS software, version 9.3. The PPA's polygons were defined according to the Forest Code, Resolution No. 303/2002 of CONAMA and the Municipal Decree No. 12,450/2008 and the occupations were classified and mapped according to CONAMA Resolution No. 369/2006, in 2004 and 2010. Subsequently a qualitative and quantitative assay of maps and data generated was performed. It was evaluated that the two lagoons used in the study: Opaia and Porangabussu have suffered environmental impacts due to the activities and occupations present in their areas. It was found that the city legislation does not meet the deliberations of Federal legislation concerning the delimitation of preservation areas, been less restrictive. It was concluded that the use of GIS subsidizes satisfactorily the assessment and diagnosis of the use and occupation of water ecosystems, allowing a qualitative and quantitative analysis.

Key-Words: Permanent Preservation Areas, Urban Lagoons, Environmental Impacts, GIS.

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