

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

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

DOI: <http://dx.doi.org/10.22201/iingen.0718378xe.2020.13.2>

Vol. 13, No. 2
6 de agosto de 2020

ISSN 0718-378X

Editado por:





ISSN 0718-378X

REVISTA AIDIS

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

Temática y alcance

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. Publica contribuciones originales de calidad y actualidad evaluadas por pares, dentro de su área de competencia. Se presentan trabajos que abarcan aspectos relacionados con el conocimiento científico y práctico, tanto tecnológico como de gestión, dentro del área de Ingeniería y Ciencias Ambientales en Latinoamérica.

El enfoque es multidisciplinario, 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, educación, legislación y política ambiental, gestión ambiental, sostenibilidad y participación social, entre otros.

Cada edición muestra los trabajos que derivan del arbitraje académico estricto de carácter internacional. También se publican números especiales de temas particulares 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.

Editor en Jefe de la revista

Dr. Germán Buitrón Méndez
Investigador Instituto de Ingeniería-UNAM

ISSN

0718-378X

Entidad editora

Instituto de Ingeniería, UNAM
Ciudad Universitaria, Coyoacán, México D.F.; C.P. 04360
Teléfono: (52) (55) 56-23-36-00; Fax: (52) (55) 56-16-28-94

Coordinadora editorial y Secretaría técnica

Biól. Blanca P. Gamboa Rocha
Instituto de Ingeniería, UNAM, México. DF.

Información Legal

La Revista AIDIS de Ingeniería y Ciencias Ambientales: Investigación, desarrollo y práctica es una publicación electrónica cuatrimestral, editada en el Instituto de Ingeniería, UNAM.

Administrador de la plataforma (OJS)

Biól. Blanca P. Gamboa Rocha
Instituto de Ingeniería, UNAM, México. DF.

Reservas de derechos al uso exclusivo:
04-2011-011413271800-203

Contacto

revista_aidis@pumas.iingen.unam.mx (Principal)
revista.aidis@gmail.com



ISSN 0718-378X

REVISTA AIDIS

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

Directorio

Junta editorial

Dr. Germán Buitrón Méndez
Editor en jefe

MSc. Ing. Nery Martín Méndez y Méndez
Presidente de AIDIS

Dra. Rosa María Ramírez Zamora
Directora del Instituto de Ingeniería, UNAM

Consejo editorial

Dr. Adalberto Noyola Robles
Instituto de Ingeniería, UNAM, México.

Prof. André Bezerra dos Santos
Universidade Federal do Ceará, Brasil.

Prof. Cleverson V. Andreoli
Instituto Superior de Administração e Economia,
ISAE/FGV, Brasil.

Dr. Darci Campani
Universidade Federal do Rio Grande do Sul, Brasil.

Dr. David Jeison Núñez
Universidad de la Frontera, Chile.

Dr. Eric Houbron
Universidad Veracruzana, México.

Prof. Eugenio Foresti
Universidade de São Paulo, Brasil.

Dr. Francisco Cervantes Carrillo
Instituto de Ingeniería, UNAM, México.

Dra. Gabriela Moeller Chávez
Universidad Politécnica de Morelos, México.

Dr. Germán Buitrón Méndez
Instituto de Ingeniería, UNAM, México.

Prof. Leo Heller
Universidade Federal de Minas Gerais, Brasil.

Dr. Manuel Salvador Rodríguez Susa
Facultad de Ingeniería,
Universidad de los Andes, Bogotá, Colombia.

Dr. Marcel Szanto Narea
Pontificia Universidad Católica de Valparaíso,
Chile.

Prof. Marcelo Zaiat
Escola de Engenharia de Sao Carlos, Brasil.

Prof. Marcos von Sperling
Universidade Federal de Minas Gerais, Brasil.

Dra. Mirna Argueta Iria
Servicio Autónomo Nacional de Acueductos y
Alcantarillados, Honduras.

Prof. Rafael Bastos
Universidade Federal de Visosa, Brasil.

Dr. Rolando Chamy Maggi
Universidad Católica de Valparaíso, Chile.



Universidad Nacional
Autónoma de México

Portal de revistas
científicas y arbitradas
de la UNAM

Tabla de Contenido

Vol. 13, No. 2

CULTIVO DE TILÁPIAS EM ESGOTOS TRATADOS, COM DIFERENTES NÍVEIS DE ARRAÇOAMENTO E SUPLEMENTAÇÃO COM VITAMINA C.

TILAPIA FARMING IN TREATED WASTEWATER WITH DIFFERENT LEVELS OF FEEDING AND DIETARY VITAMIN C.

Rafahel Marques Macedo Fontenele, Emanuel Soares dos Santos, José Gilmar da Silva do Nascimento, Suetônio Mota

202-217

ECOPONTOS: ESTUDO DE CASO DOS EQUIPAMENTOS URBANOS PARA A GESTÃO DE RESÍDUOS SÓLIDOS.

ECOPONTOS: CASE STUDY OF URBAN EQUIPMENT FOR THE MANAGEMENT OF SOLID WASTE.

Augusto Azevedo da Silva, Bernardo Arantes do Nascimento Teixeira

218-232

ANÁLISE DE SÉRIES TEMPORAIS HIDROLÓGICAS EM UMA PEQUENA BACIA HIDROGRÁFICA RURAL DA AMAZÔNIA.

ANALYSIS OF HYDROLOGIC TIME SERIES IN A SMALL RURAL AMAZONIAN CATCHMENT.

Rodrigo Silvano Silva Rodrigues, Lindemberg Lima Fernandes, Francisco Carlos Lira Pessoa, Diêgo Lima Crispim, Bruna Roberta Pereira Lira

233-250

ANÁLISE DA VIABILIDADE DE MINI COMPOSTEIRAS COMO MÉTODO ALTERNATIVO DE DESCARTE DE FOLHAS EM LOCAIS DE PEQUENA GERAÇÃO DE RESÍDUOS ORGÂNICOS.

ANALYSIS OF THE VIABILITY OF MINI COMPOSTERS AS AN ALTERNATIVE METHOD OF DISPOSAL OF LEAVES IN PLACES OF SMALL GENERATION OF ORGANIC WASTES.

Arthur Couto Neves, Priscila da Costa, Neemias Gonzaga Ribas, Marcos Paulo Gomes Mol

251-262

ANÁLISE TEMPORAL DA QUALIDADE DA ÁGUA DE CORPOS HÍDRICOS URBANOS.

TEMPORARY ANALYSIS OF WATER QUALITY AT URBAN RIVERS.

Robélio Mascoli Junior, Robson Campos dos Anjos, Yeda de Lima Sousa, Maria Lúcia Ribeiro

263-272

COMPARATIVO ENTRE O COMPORTAMENTO TÉRMICO DE COBERTURA VERDE EXTENSIVA E COBERTURA DE FIBROCIMENTO NO CLIMA DA CIDADE DE SÃO LEOPOLDO, BRASIL.

COMPARATIVE BETWEEN THERMAL BEHAVIOR OF GREEN EXTENSIVE ROOF AND FIBROCIMENT ROOF IN THE CLIMATE OF THE CITY OF SÃO LEOPOLDO, BRAZIL.

Matheus Sabardelotto Baldo, Bruna Liliâne Brenner, Marco Aurelio Stumpf Gonzalez, Andrea Parisi Kern, Marco Aurelio Stumpf Gonzalez

273-288

**PARÂMETROS DE TRATABILIDADE EM SISTEMAS DE ALAGADOS CONSTRUÍDOS
APLICADO AO REUSO DE RESÍDUOS DE DESSALINIZAÇÃO.**

*TRATABILITY PARAMETERS IN CONSTRUCTED WETLANDS APPLIED TO THE REUSE OF
DESALINATION RESIDUES.*

Marina Gadens Berton Zaika, Marcos Rogério Széliga, Ana Carolina B. Kummer, Giovana K.
Wiecheteck, Luíza C. Campos, Gabriel Carranza, Miguel Acevedo

289-308

**CONFIABILIDADE VOLUMÉTRICA DE RESERVATÓRIOS DE ACUMULAÇÃO DE ÁGUA DE
CHUVA DIMENSIONADOS COM SÉRIES HISTÓRICAS MENSASIS.**

*VOLUMETRIC RELIABILITY OF RAINWATER ACCUMULATION RESERVOIRS DIMENSIONED WITH
MONTHLY HISTORICAL SERIES.*

Cinthyia Santos da Silva, Gilson Barbosa Athayde Júnior

309-319

**APLICAÇÃO DA PEGADA ECOLÓGICA NA GESTÃO DE RESÍDUOS SÓLIDOS URBANOS
ATRAVÉS DE ANÁLISE DE COMPONENTES PRINCIPAIS: ESTUDO DA CIDADE DE RECIFE,
BRASIL.**

*APPLICATION OF THE ECOLOGICAL FOOTPRINT IN THE MANAGEMENT OF SOLID URBAN WASTE
THROUGH ANALYSIS OF MAIN COMPONENTS: STUDY OF THE CITY OF RECIFE, BRAZIL.*

Amanda Rodrigues Santos Costa, Rodrigo Cândido Passos Silva, José Fernando Thomé
Jucá, Soraya Giovaneti El-Deir

320-333

**RAZÃO N/P, CIANOBACTÉRIAS E ÍNDICE DE ESTADO TRÓFICO EM TRÊS RESERVATÓRIOS
SOB ESTIAGEM PROLONGADA NO NORDESTE.**

*N/P RATIO, CYANOBACTERIA AND TROPHIC STATE INDEX AT THREE RESERVOIRS UNDER A
PROLONGED DROUGHT IN BRAZIL'S NORTHEAST.*

Reinaldo Fontes Cavalcante, Maria Patrícia Sales Castro, Mateus de Alencar Costa,
Fernando José Araújo da Silva

334-349

**POTENCIAL DE POLUIÇÃO DIFUSA ORIGINADO PELAS ÁGUAS PLUVIAIS ESCOADAS EM
PORÇÃO URBANA DE BACIA HIDROGRÁFICA.**

*POTENTIAL OF DIFFUSE POLLUTION FROM STORM WATER RUNOFF IN URBAN HYDROGRAPHIC
BASIN.*

José Biscaíno Neto, Gabriel Coimbra Rabelo, Caio Veneno Vendramim, Welliton Leandro de
Oliveira Boina, Rosane Freire

350-366

**ESTIAGEM PROLONGADA E CONTEÚDO IÔNICO DAS ÁGUAS DE DOIS RESERVATÓRIOS DO
SEMIÁRIDO BRASILEIRO.**

*PROLONGED DROUGHT AND IONIC CONTENT OF THE WATER OF TWO BRAZILIAN
SEMIARID RESERVOIRS.*

Ana Carolina de Oliveira Nobre Batista, Stephanie de Oliveira Souza, Maria Patrícia Sales
Castro, Fernando José Araújo da Silva

367-381

AVALIAÇÃO DE INDICES DE SECA METEOROLÓGICA E HIDROLÓGICA EM RELAÇÃO AO IMPACTO DE ACUMULAÇÃO DE ÁGUA EM RESERVATÓRIO: UM ESTUDO DE CASO PARA O RESERVATÓRIO DE JUCAZINHO-PE.

EVALUATION OF METEOROLOGICAL AND HYDROLOGICAL DRY INDICES IN RELATION TO THE IMPACT OF WATER ACCUMULATION IN RESERVOIR: A CASE STUDY FOR THE RESERVOIR OF JUCAZINHO-PE.

Luiz Martins de Araujo Junior, Francisco de Assis de Souza Filho, Daniel Antônio Camelo Cid, Samiria Maria Oliveira da Silva, Cleiton da Silva Silveira

382-398

ELECTRO-BIOREMEDIATION AND EVALUATION OF BIOLOGICAL ACTIVITY IN SOILS CONTAMINATED BY HYDROCARBONS.

Robson Evaldo Gehlen Bohrer, Diosnel Antonio Rodriguez Lopez, Ênio Leandro Machado, Adriane Lawisch Rodriguez, Andrea Moura Bernardes, Fernando Almeida Santos, Paulo Eichler

399-417

A SUSTENTABILIDADE NO COMPORTAMENTO DOS FREQUENTADORES DE UM CAMPUS UNIVERSITÁRIO: ANÁLISE POR MEIO DE PAINEL INTERATIVO.

SUSTAINABLE BEHAVIOUR OF USERS OF A UNIVERSITY CAMPUS: ANALYSIS THROUGH AN INTERACTIVE PANEL.

Luciana Londero Brandli, Amanda Lange Salvia, Vanessa Tibola da Rocha, Janaina Mazutti, Giovana Reginatto

418-430

REMOÇÃO DE BENZENO, TOLUENO E XILENO EM REATORES FÚNGICOS EM BATELADA. BENZENE, TOLUENE AND XYLENE REMOVAL FOR FUNGI BATCH REACTOR.

Carlos Ronald Pessoa Wanderley, João Paulo da Silva Siqueira, Marcus Vinícius Freire Andrade, Patricia Celestino Carvalho de Oliveira, Iolanda Cristina Silveira Duarte, Glória Maria Marinho Silva, Kelly de Araújo Rodrigues Pessoa

431-442

APLICAÇÃO DA EQUAÇÃO DE INTENSIDADE PLUVIOMÉTRICA DO MUNICÍPIO DE GURUPI – TOCANTINS.

RAINFALL INTENSITY EQUATION APPLICATION OF GURUPI – TOCANTINS

Fabiano Fagundes, Julierme Siriano da Silva, Evandro Schmitt, Joel Carlos Zukowski Junior

443-455

EQUACIONAMENTO DOS VIESES EM CHEIAS DE PROJETO REFERÊNCIA E SIMULADA A PARTIR DE HIETOGRAMAS SINTÉTICOS: CASO DE ESTUDO BACIA HIDROGRÁFICA DE SÍTIOS NOVOS – CEARÁ.

EQUATING THE BIAS FROM REFERENCE DESIGN FLOOD AND SIMULATED DESIGN FLOOD OBTAINED FROM SYNTHETIC HYETOGRAPH: CASE STUDY OF SÍTIOS NOVOS BASIN.

Catine Antônio Chimene, Jose Nilson Bezerra Campos

456-469

ESTUDO DAS CONCENTRAÇÕES DE CHUMBO DETECTADAS NO SOLO DE OLARIAS NO DISTRITO DE MARAGOGIPINHO, MUNICÍPIO DE ARATUÍPE, BAHIA, BRASIL.

A STUDY OF THE LEAD CONTENTS DETECTED IN SOILS FROM ARTESIAN POTTERY ACTIVITIES IN MARAGOGIPINHO TOWN, BAHIA, BRAZIL.

Gustavo Alonso Muñoz Magna, Reginaldo dos Santos Almeida, Joya Emilie de Menezes Correia-Deur

470-484

AVALIAÇÃO DO USO DE TRINCHEIRAS DE INFILTRAÇÃO PARA ATENUAÇÃO DE PICOS DE CHEIA NA CIDADE DO CRATO-CE, BRASIL.

EVALUATION OF THE USE OF INFILTRATION TRENCHES FOR REDUCTION OF RUNOFF IN CRATO-CITY, BRAZIL.

Francisco Fábio de Sousa Feitosa, Paulo Roberto Lacerda Tavares, Marco Aurélio Holanda de Castro, Celme Torres Ferreira da Costa

485-499

ELETROCOAGULAÇÃO APLICADA AO TRATAMENTO DE LIXIVIADO DE ATERRO SANITÁRIO.

ELECTROCOAGULATION APPLIED TO LANDFILL LEACHATE TREATMENT.

Neanderson Galvão, Jeanette Beber de Souza, Carlos Magno de Sousa Vidal

500-514

DESEMPENHO ENERGÉTICO E TRATAMENTO DE ÁGUA RESIDUÁRIA EM FOTOBIOREATOR CONTÍNUO ILUMINADO ARTIFICIALMENTE.

ENERGY PERFORMANCE AND WASTEWATER TREATMENT IN AN ARTIFICIALLY ILLUMINATED CONTINUOUS PHOTOBIOREACTOR.

Raquel Gomes de Oliveira, Fábio Vassoler, Aníbal Fonseca Santiago

515-529

MODELAGEM HIDRODINÂMICA E AVALIAÇÃO DO DECAIMENTO DO FÓSFORO EM UM LAGO URBANO HIPEREUTRÓFICO.

HYDRODYNAMIC MODELING AND PHOSPHORUS DECAY EVALUATION OF A HYPEREUTROPHIC URBAN LAKE.

Janine Brandão de Farias Mesquita, Sofia Midauar Gondim Rocha, Iran Eduardo Lima Neto

530-545

ANÁLISE SITUACIONAL DAS CONDIÇÕES SANITÁRIAS DOS DOMICÍLIOS DAS FAMÍLIAS QUILOMBOLAS REGISTRADAS NO CADÚNICO, 2016.

SITUATIONAL ANALYSIS OF THE SANITARY CONDITIONS OF THE REGISTERED QUILOMBOLA FAMILIES IN CADÚNICO, 2016.

Kasandra Isabella Helouise Mingoti Poague, Uende Aparecida Figueiredo Gomes

546-566

INTERFACE GRÁFICA SOB A UTILIZAÇÃO DA LÓGICA FUZZY: A QUALIDADE DE ÁGUA EM RESERVATÓRIOS.

GRAPHIC INTERFACE UNDER THE USE OF FUZZY LOGIC: WATER QUALITY IN RESERVOIRS.

Paulo Henrique Pereira Borges, Halana Karine Dias dos Santos, Camila Santiago Martins Bernardini, Ingrid Fernandes de Oliveira Alencar, Débora Carla Barboza de Sousa, Raquel Jucá de Moraes Sales

567-581

ANÁLISE COMPARATIVA DE TÉCNICAS DE DESINFECÇÃO EM EFLUENTE DE ETE UTILIZANDO MICRORGANISMOS INDICADORES.

COMPARATIVE ANALYSIS OF DISINFECTION TECHNIQUES IN WASTEWATER OF ETE USING MICROORGANISM INDICATORS.

Thaís Kovalski, Carlos Raphael Pedroso, Jeanette Beber de Souza, Grasielle Soares Cavallini

582-603

OZONIZAÇÃO E ARRASTE DE GASES NO PÓS-TRATAMENTO DE EFLUENTE SANITÁRIO.

OZONIZATION AND GAS STRIPPING IN POST-TREATMENT OF SANITARY EFFLUENT.

Raíssa Faria de Araújo, Marcio Ricardo Salla, Alessandra Maysa Araújo Rodrigues

604-615

USO DE PLAGUICIDAS E INTOXICACIONES AGUDAS EN LA POBLACIÓN RURAL DE SAN BALTAZAR CHICHICÁPAM, OAXACA, MÉXICO.

USE OF PESTICIDES AND ACUTE POISONING IN RURAL POPULATION OF SAN BALTAZAR CHICHICAPAM, OAXACA, MEXICO.

Mitzy Karen Rodríguez Bornios, Denisse Zavaleta Silva, Honorio Torres Aguilar, Leobardo Reyes Velasco, Héctor Ulises Bernardino Hernández

616-629

ISOLAMENTO E CARACTERIZAÇÃO MORFOLÓGICA DE MICRORGANISMOS PRESENTES NO PROCESSO DE COMPOSTAGEM DE RESÍDUOS DE ORIGEM VEGETAL.

ISOLATION AND MORPHOLOGICAL CHARACTERIZATION OF MICROORGANISMS PRESENT IN THE PROCESS OF COMPOSTING LEAF WASTES.

Marcos Paulo Gomes Mol, Ana Paula de Jesus Santos, Diane Cordeiro Araújo, Fabiana Ribeiro Viana, Agnes Kiesling Casalli

630-639

ANÁLISE DE SISTEMAS DE TRATAMENTO DE EFLUENTES DE ABATEDOUROS BOVINOS POR LAGOAS DE ESTABILIZAÇÃO E POR REATOR UASB SEGUIDO DE LAGOA DE POLIMENTO.

ANALYSIS OF SYSTEMS OF TREATMENT OF EFFLUENTS OF BOVINE LAYERS BY ESTABLISHMENT LAKES AND BY UASB FOLLOWED REPLACER OF POLISH POND

Patrick Lucas Iopp, Alesi Teixeira Mendes

640-654

COMPOSTO ORGÂNICO OBTIDO POR PROCESSO DE COMPOSTAGEM DE LODO DE ESGOTO COM INOCULAÇÃO DE BIORREMEIADOR.

ORGANIC COMPOUND OBTAINED BY THE PROCESS OF COMPOSTING OF SEWAGE SLUDGE WITH INOCULATION OF BIORREMEIADOR.

Welliton Leandro de Oliveira Boina, João Sérgio Cordeiro, Roberto Lyra Villas Bôas, Rosane Freire Boina

655-668

REVISTA AIDIS

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

CULTIVO DE TILÁPIAS EM ESGOTOS TRATADOS, COM DIFERENTES NÍVEIS DE ARRAÇOAMENTO E SUPLEMENTAÇÃO COM VITAMINA C

Rafahel Marques Macedo Fontenele¹

* Emanuel Soares dos Santos²

José Gilmar da Silva do Nascimento¹

Suetônio Mota¹

TILAPIA FARMING IN TREATED WASTEWATER WITH DIFFERENT LEVELS OF FEEDING AND DIETARY VITAMIN C

Recibido el 11 de febrero de 2018; Aceptado el 30 de abril 2020

Abstract

In order to assess the effect of vitamin C supplementation at different feeding rates on the zootechnical, environmental and microbiological performance of the Nile tilapia, *Oreochromis niloticus*, grown in domestic wastewater treated in stabilization ponds, we used nine 50 m³ tanks divided into three experimental treatments with four replicates, varying the amount of feed and supplementing the dosage of Vitamin C up to 1500 mg per kg of feed. Based on the analysis of the assessed parameters, we found that the treatment with the best results was the one with a quarter of feed supplemented with 1500 mg of vitamin C, because when evaluating the zootechnical performance this was statistically even with the other treatments, already in relation to the environmental indicators it was observed that the fish culture acts as a polishing to the treatment of the effluent, in relation to the microbiological indicators it was observed that the produced fish was within the sanitary conditions recommended by the current legislation.

Keywords: ascorbic acid, stabilization ponds; *Oreochromis niloticus*, reuse in pisciculture.

¹ Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil.

² Instituto Federal de Educação, Ciência e Tecnologia do Ceará campus Aracati, Brasil.

*Autor correspondente: Instituto Federal de Educação, Ciência e Tecnologia do Ceará campus Aracati, Brasil. Rodovia CE-040, Km 137,1, s/n – Bairro Aeroporto, Aracati, Ceará, Código postal 62800-000, Brasil. Email: santos.e.s@ifce.edu.br



REVISTA AIDIS

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

ECOPONTOS: ESTUDO DE CASO DOS EQUIPAMENTOS URBANOS PARA A GESTÃO DE RESÍDUOS SÓLIDOS

* Augusto Azevedo da Silva¹
Bernardo Arantes do Nascimento Teixeira¹

ECOPONTOS: CASE STUDY OF URBAN EQUIPMENT FOR THE MANAGEMENT OF SOLID WASTE

Recibido el 20 de mayo de 2018; Aceptado el 6 de febrero 2019

Abstract

The use of equipment known as Point of Support (PA) or Ecopontos in the integrated management of urban solid waste (RSU) has occurred in several cities in the world and some in Brazil. In this sense, this article has as main objective to make an evaluation of the existing system of Ecopontos in the city of São José do Rio Preto, SP. To do so, data were collected on such equipment, such as quantities and types of waste received and also an evaluation of the system by users divided into three segments: residents (residents), small cargo transporters and ecoponto operators. As a result, it was observed that the use of AP was efficient for receiving small volumes delivered voluntarily. However, the data indicated problems in the system, showing the need for a more efficient management. It can be considered that PAs are an equipment that improves MSW management, in the case studied, absorbing several typologies of MSW, such as 23% of construction waste and with approval by the majority of users in the evaluated segments.

Keywords: MSW, support point, Ecoponto, waste management.

¹ Departamento de Engenharia Civil, Programa de Engenharia Urbana. Universidade Federal de São Carlos, Brasil.

* *Autor Correspondente:* Programa de Pós Graduação em Engenharia Urbana, Universidade Federal de São Carlos. Endereço: Rodovia Washington Luís, km 235 - São Carlos-SP - Área Norte - CEP 13565-905. Brasil. Email: augustoasilva@gmail.com

REVISTA AIDIS

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

ANÁLISE DE SÉRIES TEMPORAIS HIDROLÓGICAS EM UMA PEQUENA BACIA HIDROGRÁFICA RURAL DA AMAZÔNIA

* Rodrigo Silvano Silva Rodrigues¹
Lindemberg Lima Fernandes¹
Francisco Carlos Lira Pessoa¹
Diêgo Lima Crispim¹
Bruna Roberta Pereira Lira¹

ANALYSIS OF HYDROLOGIC TIME SERIES IN A SMALL RURAL AMAZONIAN CATCHMENT

Recibido el 30 de mayo de 2018; Aceptado el 29 de marzo 2019

Abstract

This study verifies the hydrological relationships of homogeneity and tendency of rain, flow and water level, and the climatic variability of these precipitations in a Prata river basin, located in the municipality of Capitão Poço-PA. For precipitations, data from a historical series of 30 years were used. For flow rates and water levels data were used in the period from 1988 to 2005. The behavior of total precipitations, flows and average dimensions was analyzed by the method of the Pettitt homogeneity test and trend and magnitude test provided by Mann-Kendall and Sen's Tests and the correlation between the variables in the period of their simultaneous occurrences. The climatic phenomena El Niño and La Niña influence directly causing anomalies on the rainfall. In the Prata catchment, the flows and coasts simultaneously have the same behavior as a function of time, however, these variables have a weak correlation with precipitation. In general, no significant trends were observed in the behavior of rainfall and flow series. The average levels, in general, are not homogeneous and have positive trends that may be related to the dynamics of land use and land cover. The analysis of trends for rainfall in the basin of the Prata River is compatible with macro analyzes focused on the region.

Keywords: Pettitt, Mann-Kendall, Sen's, climatic phenomena.

¹ Universidade Federal do Pará, Brasil.

* Autor correspondente: Instituto de Tecnologia, Faculdade de Engenharia Sanitária e Ambiental, Universidade Federal do Pará. Rua Augusto Correa, 01 – Guamá, Belém, Pará, 66.075-110, Brasil. Email: rssr@ufpa.br

REVISTA AIDIS

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

ANÁLISE DA VIABILIDADE DE MINI COMPOSTEIRAS COMO MÉTODO ALTERNATIVO DE DESCARTE DE FOLHAS EM LOCAIS DE PEQUENA GERAÇÃO DE RESÍDUOS ORGÂNICOS

* Arthur Couto Neves¹
Priscila da Costa²
Neemias Gonzaga Ribas¹
Marcos Paulo Gomes Mol¹

ANALYSIS OF THE VIABILITY OF MINI COMPOSTERS AS AN ALTERNATIVE METHOD OF DISPOSAL OF LEAVES IN PLACES OF SMALL GENERATION OF ORGANIC WASTES

Recibido el 31 de mayo de 2018; Aceptado el 28 de marzo 2019

Abstract

Considering the increase in urban solid waste, alternatives became necessary to decrease the destination of recyclable and organic wastes to landfills. It is highlighted, then, the composting process as allied to the disposal of organic solid waste. The present study aims to evaluate the viability of mini composters as an alternative to the discard of leaves in locals of low generation. Four reactors were produced: two of Polyethylene terephthalate (PET), of volume equal to 2 liters and two 5-liter containers. The monitored parameters along the 142 days were moisture (weekly), temperature (twice a week through a thermometer of internal measurement), and height (also twice a week). Shapiro-Wilk test, Kruskal-Wallis with post-hoc by Nemenyi and Pearson's correlation test and by Multiple Comparisons were applied, using software R. It was observed that the maximum and minimum temperature amplitudes for the reactors were 32.5°C (SC5L) and 21°C (CC5L), respectively, maintaining below 30°C from most of the experiment. Only CC5L presented a statistical difference ($p < 0.05$) to the ambient temperature. It was also verified that the reactor CC2L showed the biggest reduction in volume (61.4%) and intense brownish color, evidencing an advanced stage of material degradation. Hence, it was concluded that this composting process could be used as an adequate alternative for the discard of leaves in a location of low wastes generation, being a procedure of easy execution and maintenance.

Keywords: green waste, composting, waste management.

¹ Diretoria de Pesquisa e Desenvolvimento. Fundação Ezequiel Dias. Belo Horizonte, Brasil.

² Diretoria do Instituto Octávio Magalhães. Fundação Ezequiel Dias. Belo Horizonte, Brasil.

* *Autor correspondente:* Serviço de Desenvolvimento Tecnológico Farmacêutico, Diretoria de Pesquisa e Desenvolvimento. Fundação Ezequiel Dias – FUNED. Rua Conde Pereira Carneiro, 80. Bairro Gameleira. Cidade Belo Horizonte, Minas Gerais. Código Postal (CEP) 30510-010. Brasil. Email: coutoarthur@gmail.com

REVISTA AIDIS

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

ANÁLISE TEMPORAL DA QUALIDADE DA ÁGUA DE CORPOS HÍDRICOS URBANOS

* Robélio Mascoli Junior ¹
Robson Campos dos Anjos ¹
Yeda de Lima Sousa ¹
Maria Lúcia Ribeiro ¹

TEMPORARY ANALYSIS OF WATER QUALITY AT URBAN RIVERS

Recibido el 14 de junio de 2018; Aceptado el 11 de junio 2019

Abstract

Anthropogenic activities generate degradation of the water quality of water bodies, making it extremely important to analyze chemical, physical and biological parameters for water resources planning and management. The objective of this study was to evaluate the changes in water quality of water bodies located in the city of Campo Grande-MS, using the Water Quality Index (IQA) methodology described by the Environmental Sanitation Technology Company of the state of São Paulo (CETESB), comparing data from the years 2015 to 2017. With the analysis of the obtained results it is concluded that there is improvement in the IQA during the years studied, ranging from regular to good. During this period, it was assumed that there was a growth in the discharge of non-domestic effluents due to the increase in BOD and the decrease in the concentration of thermotolerant coliforms. Mitigating actions and government programs should be applied to improve and preserve environmental quality, as well as continuous monitoring of these water bodies.

Keywords: environmental degradation, water resources, water quality index.

¹ Universidade Federal de Mato Grosso do Sul, Brasil.

* Autor correspondente: Universidade Federal de Mato Grosso do Sul. Cidade Universitaria, Campo Grande, Mato Grosso do Sul. 79090-900. Brasil. Email: robelio03@gmail.com

REVISTA AIDIS

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

COMPARATIVO ENTRE O COMPORTAMENTO TÉRMICO DE COBERTURA VERDE EXTENSIVA E COBERTURA DE FIBROCIMENTO NO CLIMA DA CIDADE DE SÃO LEOPOLDO, BRASIL

Matheus Sbardelotto Baldo ¹

Bruna Liliâne Brenner ^{1,2}

* Marco Aurélio Stumpf González ³

Andrea Parisi Kern ¹

COMPARATIVE BETWEEN THERMAL BEHAVIOR OF GREEN EXTENSIVE ROOF AND FIBROCIMENT ROOF IN THE CLIMATE OF THE CITY OF SÃO LEOPOLDO, BRAZIL

Recibido el 10 de agosto de 2018; Aceptado el 15 de junio 2019

Abstract

Solutions for the thermal performance enhancement and the energy consumption reduction in buildings have been studied in recent years. The use of green roofs, characterized as a multi-layer horizontal sealing system required for a plant complex cultivation, has been presented as a solution with benefits for some types of climate. The study aims to evaluate the thermal performance of this coverage type in São Leopoldo, southern Brazil, compared to a conventional fiber-cement roof. Two experimental prototypes were constructed in this city. The first is representative of a conventional cover in fiber cement 6mm and the second have a green roof. The analysis was performed through measurements of thermal variables with specific sensors. The variation of the external and internal roofs surface temperatures and the variations of the internal air temperatures of both prototypes were evaluated and it was compared with the variations of the air temperature and the global solar radiation of the external environment. After the data collection and analysis of the results, it was verified that the prototype with green roof showed significantly lower daily thermal oscillations in relation to the reference prototype. During the day, warmer period, temperatures were lower relative to the reference prototype and during the night, colder period, were higher. The green roof had a significant capacity to delay and dampen the external thermal amplitude, which contributed to the thermal regulation inside the environment, a favorable feature for the region of study in the period evaluated.

Keywords: sustainable construction, green roof, thermal behavior, energy efficiency.

¹ Programa de Pós-Graduação em Engenharia Civil, Universidade do Vale do Rio dos Sinos, Brasil.

² Programa de Pós-Graduação em Engenharia Civil, Universidade do Vale do Rio dos Sinos / Faculdade da Serra Gaucha, Bento Gonçalves, RS, Brasil.

³ Programa de Pós-Graduação em Engenharia Civil, Universidade do Vale do Rio dos Sinos, Brasil.

*Autor correspondente: Programa de Pós-Graduação em Engenharia Civil, Universidade do Vale do Rio dos Sinos.
Email: mgonzalez@unisinos.br

REVISTA AIDIS

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

PARÂMETROS DE TRATABILIDADE EM SISTEMAS DE ALAGADOS CONSTRUÍDOS APLICADO AO REUSO DE RESÍDUOS DE DESSALINIZAÇÃO

* Marina Gadens Berton Zaika ¹
Marcos Rogério Széliga ¹
Ana Carolina B. Kummer ¹
Giovana K. Wiecheteck ¹
Luiza C. Campos ²
Gabriel Carranza ³
Miguel Acevedo ⁴

TRATABILITY PARAMETERS IN CONSTRUCTED WETLANDS APPLIED TO THE REUSE OF DESALINATION RESIDUES

Recibido el 20 de agosto de 2018; Aceptado el 28 de agosto 2019

Abstract

The aim of this research was to evaluate the treatability parameters, which were defined as variables, factors, hydraulic and operating configurations, which, by hypothesis, could potentially influence the process of improving the quality of brine resulting from desalination by reverse osmosis, through the application of Constructed Wetland Systems, cultivated with elephantgrass (*Pennisetum purpureum*, Schum). The studies were conducted on bench scale, within a semi-heated agricultural greenhouse. Twelve experimental units were established, and four treatment configurations were established with three replicates each, operated and monitored for five months, varying according to the operation of the system, whether continuous or static, and also in the hydraulic retention time of three or four days. Water samples were collected at the entrance and exit of each unit, and were analyzed in the laboratory for the physicochemical characterization and, monitoring of parameters: pH, turbidity, salinity, hardness, calcium, chlorides, electrical conductivity and total dissolved solids. The results were submitted to analysis of variance and Tukey's test, at a 95% confidence level, using the statistical program SISVAR. The systems that were submitted to the static regime, with hydraulic retention time of four days, during the first three weeks of operation, showed to be more efficient in the average removal of salinity (53.1%), hardness (69.2%), calcium (66.7%), chloride (44.5%), electrical conductivity (40.7%) and total dissolved solids (86.7%). The plant was able to absorb 0.25% of the sodium ions by its roots for its nutrition, according to the results from the scanning electron microscopy.

Keywords: brine, desalination, effluent treatment, reuse, constructed wetlands.

¹ Programa de pós-graduação em Engenharia Sanitária e Ambiental, Universidade Estadual de Ponta Grossa, Brasil.

² Dept. Civil, Environmental & Geomatic Engineering, University College London, Reino Unido.

³ University of Louisiana Lafayette, USA.

⁴ Electrical Engineering Department, University of North Texas, Denton, Texas, USA.

*Autor correspondente: Universidade Estadual de Ponta Grossa, Avenida General Carlos Cavalcanti, 4748, Uvaranas, Ponta Grossa, Paraná. CEP.:84030-900. Brasil. Email: marina_gadens@hotmail.com



REVISTA AIDIS

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

CONFIABILIDADE VOLUMÉTRICA DE RESERVATÓRIOS DE ACUMULAÇÃO DE ÁGUA DE CHUVA DIMENSIONADOS COM SÉRIES HISTÓRICAS MENSAIS

* Cinthya Santos da Silva ¹
Gilson Barbosa Athayde Júnior ²

VOLUMETRIC RELIABILITY OF RAINWATER ACCUMULATION RESERVOIRS DIMENSIONED WITH MONTHLY HISTORICAL SERIES

Recibido el 23 de agosto de 2018; Aceptado el 29 de marzo 2019

Abstract

In order to analyze the difference between the usable volume of water calculated on the basis of monthly and daily precipitation averages, this paper proposes calculating reliability coefficients to the monthly pluviometric series, for different volumes of reservoir. The conclusion that the reliability tends to increase with decreasing of the catchment area and increase of the reservoir volume, occurring however, some exceptions. Important point observed also is that the reliability coefficients can not be used without due consideration of the precipitation conditions of the region, as these can vary considerably in a country. Thus, in future studies about the sizing of the reservoir with monthly historical series, where the reliability thereof is searched, this factor should be taken into account.

Keywords: precipitation, reliability, reservoir.

¹ Instituto Federal da Paraíba, Brasil.

² Universidade Federal da Paraíba, Brasil.

*Autor correspondente: Instituto Federal da Paraíba, campus Cajazeiras, R. José Antônio da, R. José Leôncio da Silva, 300 - Lot. Jardim Oasis, Cajazeiras - PB, CEP: 58900-000. Email: santossynthia@gmail.com

REVISTA AIDIS

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

APLICAÇÃO DA PEGADA ECOLÓGICA NA GESTÃO DE RESÍDUOS SÓLIDOS URBANOS ATRAVÉS DE ANÁLISE DE COMPONENTES PRINCIPAIS: ESTUDO DA CIDADE DE RECIFE, BRASIL

* Amanda Rodrigues Santos Costa ¹
Rodrigo Cândido Passos Silva ¹
José Fernando Thomé Jucá ¹
Soraya Giovanetti El-Deir ²

APPLICATION OF THE ECOLOGICAL FOOTPRINT IN THE MANAGEMENT OF SOLID URBAN WASTE THROUGH ANALYSIS OF MAIN COMPONENTS: STUDY OF THE CITY OF RECIFE, BRAZIL

Recibido el 11 de septiembre de 2018; Aceptado el 7 de octubre de 2019

Abstract

The management of municipal solid waste is one of the most complex aspects for municipal managers due to the large volume generated and the cost for the treatment. Thus, tools that provide information for decision making can be useful as indicators of sustainability. The ecological footprint is an indicator of the environmental impact of a product or process and in the case of solid waste, the footprint of the main elements present in the urban flow can be calculated. The objective of this work was to identify the ecological footprint of the recyclable fraction of urban solid waste in the city of Recife, Pernambuco and to evaluate the correlation between waste footprints through analysis of main components, seeking to help in the search of information for management proposals. The waste footprint reveals that the impact of a waste in the environment is directly related to the environmental liabilities of the material, as well as its volume of generation. Through Principal Component Analysis it is possible to visualize graphically correlations between the footprints of the materials and from them to extract information for a more sustainable management proposition.

Keywords: indicators, multivariate statistics, sustainability.

¹ Programa de Pós-Graduação em Engenharia Civil, Universidade Federal de Pernambuco, Brasil.

² Programa de Pós-Graduação em Engenharia Ambiental, Universidade Federal Rural de Pernambuco, Brasil.

* *Autor correspondente:* Departamento de Engenharia Civil, Universidade Federal de Pernambuco. Av. Prof. Moraes Rego, 1235, Cidade Universitária, Recife - PE - CEP: 50670-901. Brasil. Email: amandarsc@gmail.com

REVISTA AIDIS

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

RAZÃO N/P, CIANOBACTÉRIAS E ÍNDICE DE ESTADO TRÓFICO EM TRÊS RESERVATÓRIOS SOB ESTIAGEM PROLONGADA NO NORDESTE

Reinaldo Fontes Cavalcante¹
* Maria Patrícia Sales Castro²
Mateus de Alencar Costa²
Fernando José Araújo da Silva²

N/P RATIO, CYANOBACTERIA AND TROPHIC STATE INDEX AT THREE RESERVOIRS UNDER A PROLONGED DROUGHT IN BRAZIL'S NORTHEAST

Recibido el 16 de septiembre de 2018; Aceptado el 28 de agosto de 2019

Abstract

The degree of eutrophication was analyzed in three reservoirs at the Brazilian semi-arid tropic, in Ceará State. The study covered a period of one decade and the water sampling was quarterly. The analysis took into account total nitrogen (N), total phosphorus (P), chlorophyll *a* (C_{la}) and total cyanobacteria numbers (CB). These quality parameters were complemented with rainfall data (P_p) and percentage of available water volume in the reservoirs (AV%). The percentages of compliance of the C_{la} concentrations with the environmental standard (CONAMA 357/05) were 60, 6 and 100% in the Banabuiú, Cipoada and Capitão Mor reservoirs, respectively. For total phosphorus, the percentages were 10, 63 and 12%, respectively. For the total count of cyanobacteria, the compliance results were 23, 6 and 86%. The results showed that the degree of eutrophication in Cipoada was higher than in Banabuiú, followed by Captain Mor. The environmental standard does not directly address total nitrogen, but this nutrient correlated positively with P and C_{la}. Concentrations of total nitrogen may have an equivalent impact to phosphorus. In the study, N: P > 38 ratios predominated in Cipoada and Banabuiú. In Captain Mor the range from 22 to 38 was predominant for the N: P ratio. The TSI values were high, indicating hypertrophy in the Cipoada and Banabuiú, and eutrophic in Captain Mor. Reduction of AV% contributes to the process of eutrophication, with increased nutrients and cyanobacteria counts.

Keywords: semi-arid tropic, eutrophication, climate change.

¹ Instituto Federal de Educação e Ciência e Tecnologia do Ceará – Campus do Quixadá, Departamento de Engenharia Ambiental e Sanitária, Ceará, Brasil.

² Universidade Federal do Ceará, Campus do Pici, Centro de Tecnologia, Departamento de Engenharia Hidráulica e Ambiental, Fortaleza, Ceará, Brasil.

* Autor correspondente: Universidade Federal do Ceará, Campus do Pici, CEP- 60445-760. Bloco 713. Fortaleza, Ceará, Brasil. Email: patricia.sales@gmail.com



REVISTA AIDIS

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

POTENCIAL DE POLUIÇÃO DIFUSA ORIGINADO PELAS ÁGUAS PLUVIAIS ESCOADAS EM PORÇÃO URBANA DE BACIA HIDROGRÁFICA

José Biscaíno Neto ¹
Gabriel Coimbra Rabelo ¹
Caio Veneno Vendramin ¹
Welliton Leandro de Oliveira Boina ²
* Rosane Freire ¹

POTENTIAL OF DIFFUSE POLLUTION FROM STORM WATER RUNOFF IN URBAN HYDROGRAPHIC BASIN

Recibido el 20 de septiembre de 2018; Aceptado el 30 de abril de 2019

Abstract

In the present work the effect of diffuse water pollution due to urban surface runoff to rivers and streams was analyzed. The highlight is the assessment of the polluting effect in a hydrographic basin. In order to do so, the drainage flow was measured and the drained waters of four different urban surfaces (top of basin, residential, commercial and industrial) were sampled in 15 pluviometric events, considering the duration of precipitation. The analyzes of the results were performed comparing the load values of the studied variables, allowing to discuss the contribution of the flow by the first flush phenomena. The runoff waters of the urban portion presented high pollutant loads in all events, mainly for the total solid parameters and chemical oxygen demand. The values showed that the pollution caused by urban surface runoff in areas with commercial, residential and, above all, industrial influences can contribute greatly to the degradation and reducing the quality of receiving water bodies, affecting all the hydrographic basin.

Keywords: first flush, urban runoff, water pollution.

¹ Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista “Júlio de Mesquita Filho”, Brasil.

² PPG Engenharia Urbana, Universidade Federal de São Carlos, Brasil.

* *Autor Correspondente:* FCT UNESP, Depto de Química e Bioquímica, Rua Roberto Simonsen, 305, Centro Universitário, Presidente Prudente- SP, CEP 19060-900, Brasil. Email: rosane.freire@unesp.br

REVISTA AIDIS

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

ESTIAGEM PROLONGADA E CONTEÚDO IÔNICO DAS ÁGUAS DE DOIS RESERVATÓRIOS DO SEMIÁRIDO BRASILEIRO

* Ana Carolina de Oliveira Nobre Batista ¹
Stephanie de Oliveira Souza ¹
Maria Patrícia Sales Castro ¹
Fernando José Araújo da Silva ¹

PROLONGED DROUGHT AND IONIC CONTENT OF THE WATER OF TWO BRAZILIAN SEMIARID RESERVOIRS

Recibido el 26 de septiembre de 2018; Aceptado el 7 de octubre de 2019

Abstract

The main objective of this work is to investigate the hydrochemical behavior and the ionic content in two reservoirs in Ceará, Northeast Brazil, due to changes due to prolonged drought in the region. The study comprised the surface waters of the Banabuiú and Pedras Brancas reservoirs, with samples collected between 2005 and 2017. The parameters monitored were electrical conductivity, total hardness, higher ions, hydrogen potential, total dissolved solids and temperature. In addition, a hydrochemical approach was performed from the Piper, Gibbs and Chadha diagrams. The predominant cations were those of greater mobility for both dams, while bicarbonate anion was more incident in Banabuiú and chloride in Pedras Brancas. The surface waters of the Banabuiú reservoir were classified as bicarbonated mixed, while Pedras Brancas was predominantly chlorinated sodium. The Gibbs diagram was important to show the dominance of the action of the hydrological cycle on the interaction of the cations with the rocks and the interchange of the anions with the rocks prevailing the effect of the rains and the evaporation. For White Rocks, evaporation had a predominant effect in both cases, and the interaction between rocks and surface water occurred predominantly between cations. The Chadha diagram indicated that the waters of Banabuiú had greater interchange between the mobile cations and favored by surface runoff for bicarbonate. For White Stones, the reversals of the left inferior quadrant, referring to the dominance between Na^+ and Cl^- and indicating salinization, were emphasized.

Keywords: surface waters, water scarcity, ionic interaction.

¹ Universidade Federal do Ceará, Brasil.

* *Autor correspondente:* Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Bloco 713, Avenida Humberto Monte S/N, Campus do Pici, Fortaleza–CE. CEP 60451–970, Brasil. Email: carolnobre1404@gmail.com

REVISTA AIDIS

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

AVALIAÇÃO DE INDICES DE SECA METEOROLÓGICA E HIDROLÓGICA EM RELAÇÃO AO IMPACTO DE ACUMULAÇÃO DE ÁGUA EM RESERVATÓRIO: UM ESTUDO DE CASO PARA O RESERVATÓRIO DE JUCAZINHO-PE

* Luiz Martins Araújo Junior ¹
Francisco de Assis de Souza Filho ²
Daniel Antônio Camelo Cid ²
Samiria Maria Oliveira da Silva ²
Cleiton da Silva Silveira ²

EVALUATION OF METEOROLOGICAL AND HYDROLOGICAL DRY INDICES IN RELATION TO THE IMPACT OF WATER ACCUMULATION IN RESERVOIR: A CASE STUDY FOR THE RESERVOIR OF JUCAZINHO-PE

Recibido el 1 de octubre de 2018; Aceptado el 28 de octubre 2019

Abstract

This work aims to analyze the dry state in a water accumulation reservoir and assess the severity classification difference in different time horizons over the years in order to determine what the best drought indices that can be used as triggers for shooting drought mitigation actions. For this, we used the SPI index (Standardized Precipitation Index), SPEI (Standardized Precipitation-Evapotranspiration Index), SRI (Standardized Runoff Index), IE (State Index), IS (Synthetic Index) and NM (Target levels), where such indices were compared by a qualitative and quantitative analysis. The results showed that the drought afflicting Jucazinho reservoir or dry severity level of the same, it is not always occur due to natural conditions which the reservoir is exposed. Another important finding is that content such as SPI, SPEI and SRI cannot keep the fluctuation of the water stock in the same speed as do occur.

Keywords: drought state, drought indexes, reservoir.

¹ Instituto de Engenharia e Desenvolvimento Sustentável, Universidade da Integração Internacional da Lusofonia Afro-Brasileira (UNILAB), Brasil.

² Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil.

*Autor correspondente: Instituto de Engenharia e Desenvolvimento Sustentável, Universidade da Integração Internacional da Lusofonia Afro-Brasileira - UNILAB, Campus da Liberdade, Avenida da Abolição, 3 – Centro, CEP.: 62.790-000, Redenção – CE – Brasil Email: luiz_m_jr@unilab.edu.br

REVISTA AIDIS

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

ELECTRO-BIOREMEDIATION AND EVALUATION OF BIOLOGICAL ACTIVITY IN SOILS CONTAMINATED BY HYDROCARBONS

* Robson Evaldo Gehlen Bohrer¹
Diosnel Antonio Rodriguez Lopez¹
Énio Leandro Machado¹
Adriane Lawisch Rodriguez¹
Andrea Moura Bernardes²
Fernando Almeida Santos³
Paulo Eichler³

Recibido el 15 de octubre de 2018; Aceptado el 30 de abril de 2020

Abstract

*The growing demand of actions for soil remediation has resulted in the development of alternative technologies, especially for applications of techniques in situ, caused for the many forms of contamination of soil and underground water with petroleum hydrocarbons. The present work proposed an electro-bioremediation technique to evaluate the capacity degradation of the pollutants through microorganisms present in the polluted soil. The monitoring of the degradation of hydrocarbons was accompanied through chemical analyses of Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, and Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAH). The microbiological activity was monitored through analyses of Colony-Forming Unit (CFU). The results showed that rates of degradation of the xylene, toluene and ethylbenzene had an order of 69%, 60% and 10%. The microbiologic activity presented an increase of 12.5 times for the Mould and Yeasts, and of 178.5 times for aerobic microorganisms. The isolation and biodegradation analysis pointed the existence of 26 different morphotypes, of these, 20 morphotypes (77%) possess capacity to degrade hydrocarbons that, 60% were found in the areas of influence of the cathode and 40% of the anode. The yeast-like material was isolated and identified, where the predominant genus was *Penicillium* (50%), *Paecilomyces* 16.6%, *Trichoderma* 16.6 % and *Cladosporium* 16.6%.*

Keywords: bioremediation, technologies, electrokinetic, microorganisms, petroleum.

¹ University of Santa Cruz do Sul. Department Environmental Engineering, Brazil.

² Federal University of Rio Grande do Sul, Brazil.

³ State University of Rio Grande do Sul. Department of Engineering, Brazil.

* *Corresponding author:* University of Santa Cruz do Sul. Department Environmental Engineering. Av. Independence, 2293, 96815-900. University, Santa Cruz do Sul - RS / Brazil. Email address: gehlen.bohrer@gmail.com



REVISTA AIDIS

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

A SUSTENTABILIDADE NO COMPORTAMENTO DOS FREQUENTADORES DE UM CAMPUS UNIVERSITÁRIO: ANÁLISE POR MEIO DE PAINEL INTERATIVO

Luciana Londero Brandli¹

* Amanda Lange Salvia¹

Vanessa Tibola da Rocha¹

Janaina Mazutti¹

Giovana Reginatto¹

SUSTAINABLE BEHAVIOUR OF USERS OF A UNIVERSITY CAMPUS: ANALYSIS THROUGH AN INTERACTIVE PANEL

Recibido el 17 de octubre de 2018; Aceptado el 30 de abril de 2020

Abstract

The term sustainable development, as conceived in the Brundtland report in 1987, is by definition to allow the present generation to meet their needs without compromising the future generations. However, cities have been suffering intensely with problems such as the increased accumulation of waste, difficulties of urban mobility, the precariousness of public spaces and the low availability of green areas. Therefore, this papers aims to study the perception of students, professors and employees on sustainability issues, emphasizing the importance and impact of individual behavior on problems faced by cities. To do so, an Interactive Panel composed of 6 questions was designed to find out the level of engagement of the academic community and other users of the University of Passo Fundo main campus concerning sustainability. More than a hundred responses were received and the results were analysed using descriptive statistics. These results obtained demonstrate that most respondents describe positive behaviors in relation to the issues addressed, and suggest issues that deserve improvement in order to contribute to local sustainability.

Keywords: sustainable campus, environmental education, multivariate statistics.

¹ Programa de Pós-Graduação em Engenharia Civil e Ambiental – PPGEng, Universidade de Passo Fundo, Brasil.

* *Autor correspondente:* Programa de Pós-Graduação em Engenharia Civil e Ambiental – PPGEng, Universidade de Passo Fundo, BR 285 - Bairro São José, Passo Fundo-RS. CEP 99052-900. Brasil. Email: amandasalvia@gmail.com

REVISTA AIDIS

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

REMOÇÃO DE BENZENO, TOLUENO E XILENO EM REATORES FÚNGICOS EM BATELADA

BENZENE, TOLUENE AND XYLENE REMOVAL FOR FUNGI BATCH REACTOR

* Carlos Ronald Pessoa Wanderley^{1,7}
João Paulo da Silva Siqueira¹
Marcus Vinícius Freire Andrade²
Patrícia Celestino Carvalho de Oliveira³
Iolanda Cristina Silveira Duarte⁴
Glória Maria Marinho Silva^{3,5}
Kelly de Araújo Rodrigues Pessoa^{3,6}

Recibido el 18 de octubre de 2018; Aceptado el 30 de abril 2020

Abstract

Benzene, toluene e xylene are present in gasoline and so a strong threat to the environmental and to public health due to the storage tanks leaks and varied industrial activities. This work aimed at the removal of 30 mg/L of benzene and toluene and 15 mg/L of xylene in aqueous medium by fungal batch reactors. It was also added 100 mg/L of ethanol. The choice of the kind and concentration of cells in the inoculum reactor sequencing batch was made from assay with separated variation of spores concentration of *Aspergillus niger* AN400 e *Penicillium sp.* (2×10^4 , 2×10^6 e 2×10^9 esporos/mL). The sequencing batch reactor (5 L) was inoculated with *Aspergillus niger* and operating at 48 h cycles. The immobilized biomass grown filamentous form. Registered organic matter removal (81%), benzene (60%), toluene (96%) and xylene (50%), respectively. After 4 months of reactor operation, *Penicillium sp.* was found as a contaminating species in the biofilm.

Keywords: bateladas sequenciais, crescimento fúngico, hidrocarbonetos aromáticos.

¹ Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE) – *Campus* Maracanaú, Brasil.

² Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE) – *Campus* Sobral, Brasil.

³ Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE) – *Campus* Fortaleza, Brasil.

⁴ Departamento de Biologia, Universidade Federal de São Carlos (UFSCar) – *Campus* Sorocaba, Brasil.

⁵ Programa de Pós-graduação em Tecnologia e Gestão Ambiental do IFCE – *Campus* Fortaleza, Brasil.

⁶ Programa de Pós-graduação em Ecologia e Recursos Naturais, Universidade Federal do Ceará (UFC), Brasil.

⁷ Programa de Pós-graduação em Engenharia Civil (Recursos Hídricos, Saneamento Ambiental e Geotecnia), Universidade Federal do Ceará (UFC), Brasil.

* *Autor correspondente:* Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE) – *Campus* Maracanaú, Rua Virgílio Paes, 2323, Cidade dos Funcionários. Fortaleza, Ceará, Brasil. Email: ronaldpw25@gmail.com; ronald@ifce.edu.br



REVISTA AIDIS

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

APLICAÇÃO DA EQUAÇÃO DE INTENSIDADE PLUVIOMÉTRICA DO MUNICÍPIO DE GURUPI – TOCANTINS

* Fabiano Fagundes¹
Julierme Siriano da Silva¹
Evandro Schmitt¹
Joel Carlos Zukowski Junior²

RAINFALL INTENSITY EQUATION APPLICATION OF GURUPI – TOCANTINS

Recibido el 18 de octubre de 2018; Aceptado el 30 de abril 2020

Abstract

The obtaining of the rainfall intensity equation is of fundamental importance for the taking of measures that aim at minimizing problems of hydrological origin, mainly in the control of floods. Among these measures are the sewers that are widely used in the engineering field for the realization of the surface runoff of a sub-basin. This equation is formed by the relationship between the intensity, duration and frequency that provides the parameters K , a , b and c beyond the return and concentration times. This article seeks to determine the parameters of the Gurupi-TO rainfall intensity equation, as well as to compare it with the equation provided by the Pluvio 2.1 software in the application of a rectangular culvert draining water in the Córrego Mutuca sub-basin. The parameters of the rainfall intensity equation $K = 1348.212$; $a = 0.064$; $b = 15.587$; $c = 0.770$. The sections of the culvert presented lower values with the equation presented in this study in relation to the equation provided by the software Pluvio 2.1. With the dimensions that the manhole presents currently occurred flood of the estradal body after 2 minutes of the beginning of the Rain.

Keywords: IDF curve, maximum flow, Pluvio 2.1, manhole.

¹ Departamento de Engenharia Civil, Centro Universitário UnirG, Brasil.

² Programa de Pós-Graduação em Engenharia Ambiental, Universidade Federal do Tocantins, Brasil.

* *Autor correspondente:* Departamento de Engenharia Civil, Centro Universitário UnirG. Avenida Antônio Nunes da Silva nº 2195, Coordenação de Engenharia Civil, Pq. das Acácias, Gurupi – Tocantins. CEP: 77425-500. Brasil. Email: f.fagundes76@gmail.com

REVISTA AIDIS

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

EQUACIONAMENTO DOS VIESES EM CHEIAS DE PROJETO REFERÊNCIA E SIMULADA A PARTIR DE HIETOGRAMAS SINTÉTICOS: CASO DE ESTUDO BACIA HIDROGRÁFICA DE SÍTIOS NOVOS – CEARÁ

* Catine António Chimene ^{1,2}
José Nilson Bezerra Campos ¹

EQUATING THE BIAS FROM REFERENCE DESIGN FLOOD AND SIMULATED DESIGN FLOOD OBTAINED FROM SYNTHETIC HYETOGRAPH: CASE STUDY OF SÍTIOS NOVOS BASIN

Recibido el 25 de octubre de 2018; Aceptado el 30 de abril de 2020

Abstract

Water resource planning should be more coherent and concise so that the tool used in its management could be efficient following waterbody company instructions and guidelines. The temporal distribution of irregular precipitation in the Brazilian northeast (specifically in Ceará), requires a special attention for adoption of several equipment for water security, water supply, water management and other appropriate purposes. The objective of this paper is to improve the technique (correction factor) of bias removal in the design floods (reference and simulated) in different return periods for the Sítios Novos reservoir. After the simulation of the design storm (synthetic hyetographs) in different return period and flood generation, an underestimation of the respective flow rates was observed in detriment of the referential design floods and based on the mathematical calculation of bias correction factors in 6 different forms of rainfall distribution. These factors obey a temporal and spatial invariability and have presented an overestimation of the simulated flood in the course of their use. In this sense, we opted for the method of trial and error with the objective of finding an equality of the design flood (simulated and reference) in the same return period of study in a given watershed such as the Sítios Novos Basin – Ceará.

Keywords: design flood, synthetic hyetograph, return period, correction factor.

¹ Centro de Tecnologia, Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil.

² Escola Superior de Desenvolvimento Rural, Universidade Eduardo Mondlane, Vilankulo - Inhambane, Moçambique.

* *Autor correspondente:* Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Bloco 713, Avenida Humberto Monte S/N, Campus do Pici, Fortaleza–CE. CEP 60451–970, Brasil. Email: sacredsino5@gmail.com; catine.chimene@uem.mz

REVISTA AIDIS

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

ESTUDO DAS CONCENTRAÇÕES DE CHUMBO DETECTADAS NO SOLO DE OLARIAS NO DISTRITO DE MARAGOGIPINHO, MUNICÍPIO DE ARATUÍPE, BAHIA, BRASIL

* Gustavo Alonso Muñoz Magna¹
Reginaldo dos Santos Almeida¹
Joya Emilie de Menezes Correia-Deur²

A STUDY OF THE LEAD CONTENTS DETECTED IN SOILS FROM ARTESIAN POTTERY ACTIVITIES IN MARAGOGIPINHO TOWN, BAHIA, BRAZIL

Recibido el 26 de octubre de 2018; Aceptado el 30 de abril de 2020

Abstract

This study evaluated the concentrations of lead (Pb) detected in surface soil of artisanal potteries located in the district of Maragogipinho, Aratuípe Town, Bahia, Brazil. Field samples were collected and a portable x-ray fluorescence analyzer (XRF) were used to determined Pb concentrations. The result showed that 62% of artisanal potteries were above the lead limits established by CONAMA N° 420/2009 for residential areas (300 mg/kg). The use of the metal in the vitrification ceramic process, the release of this element in the firing step and the inadequate disposal of broken pieces in a landfill were identified as the main sources of soil contamination by Pb. The concentration values detected near the potteries indicated that the a larger portion of soil was contaminated by Pb from the artisanal ceramic activities carried out in that location.

Keywords: lead, artisanal potteries, contamination, soils.

¹ Núcleo de Estudos em Engenharia Ambiental, Faculdade de Tecnologia e Ciências (UnifTC), Brasil.

¹ Ecolbio Consultoria, Brasil.

¹ Blacksmith Institute, Brasil.

* *Autor correspondente:* Núcleo de Estudos em Engenharia Ambiental, Faculdade de Tecnologia e Ciências (UnifTC). Av. Luis Viana Filho, 8812 – Paralela, Salvador, Bahia. 41741-590. Brasil. Email gmagna.ssa@ftc.edu.br

REVISTA AIDIS

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

AVALIAÇÃO DO USO DE TRINCHEIRAS DE INFILTRAÇÃO PARA ATENUAÇÃO DE PICOS DE CHEIA NA CIDADE DO CRATO-CE, BRASIL

Francisco Fábio de Sousa Feitosa ¹

* Paulo Roberto Lacerda Tavares ²

Marco Aurélio Holanda de Castro ³

Celme Torres Ferreira da Costa ²

EVALUATION OF THE USE OF INFILTRATION TRENCHES FOR REDUCTION OF RUNOFF IN CRATO-CE CITY, BRAZIL

Recibido el 1 de noviembre de 2018; Aceptado el 18 de diciembre de 2019

Abstract

The urbanization process of the last decades worldwide has caused several impacts on the environment, especially in the hydrological cycle, bringing with it an increase in the amount and magnitude of urban floods. The main objective of the present study was to evaluate the impact that the urbanization process of an urban area of the city of Crato-CE has on the surface drainage and to present a proposal for flood reduction through the simulation of infiltration trenches implanted in the public sidewalk receiving waters exclusively from the roofs of buildings. For the simulations, the computer model Storm Water Management Model - SWMM and the computer program UFC8 were used. The results showed that the modeled neighborhood after the total occupation of the buildings and paving of the streets should present problems in the surface runoff of rainwater and that the use of infiltration trenches can considerably reduce the flow peaks. The use of infiltration trenches may have benefits that go far beyond reducing flood problems in the region under study, and may reduce them in other downstream areas and favor the increase of local underground water resources reserves.

Keywords: sustainable urban drainage, surface runoff, SWMM.

¹ Instituto Nacional de Seguridade Social, Brasil.

² Universidade Federal do Cariri, Brasil.

³ Universidade Federal do Ceará, Brasil.

* *Autor correspondente:* Centro de Ciências e Tecnologia, Laboratório de Recursos Hídricos, Bloco D, Sala 64, Universidade Federal do Cariri, Av. Tenente Raimundo Rocha S/N, Bairro Cidade Universitária, Juazeiro do Norte, Ceará. CEP 63048-080. E-mail: paulo.tavares@ufca.edu.br

REVISTA AIDIS

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

ELETROCOAGULAÇÃO APLICADA AO TRATAMENTO DE LIXIVIADO DE ATERRO SANITÁRIO

* Neanderson Galvão ¹
Jeanette Beber de Souza ²
Carlos Magno de Sousa Vidal ²

ELECTROCOAGULATION APPLIED TO LANDFILL LEACHATE TREATMENT

Recibido el 3 de noviembre de 2018; Aceptado el 30 de abril de 2020

Abstract

Landfill leachate is characterized by high polluting potential. In this context, the aim of this research was to evaluate the landfill leachate treatment performance by electrocoagulation varying the current densities (DC) and electrolysis time in color, turbidity, COD, BOD and Abs₂₅₄ removal, the effluent pH was monitored during the process. An electro reactor was used containing 8 monopolar iron electrodes, spaced 1 cm apart. The electrocoagulation tests were performed in triplicate, with the application of electric currents of 2, 3, 4 and 5 A, generating DCs: 64.4, 96.64, 128.86, 161.08 A/m², for each DC applied 15, 30, 60 and 90 minutes of electrolysis times were tested. It was observed the pH elevation when higher electrolysis times and DC's applied. For all parameters evaluated the highest removal efficiencies occurred with the application of DC 161.08 A / m², in 30 minutes of electrolysis there was 84% of color removal and in 60 minutes 87% of BOD removal and 44% of Abs₂₅₄, however for the parameters Turbidity and COD the highest removal efficiencies (82% and 46%) occurred in 90 minutes of electrolysis.

Keywords: electrolytic treatment, leachate, color, turbidity, organic matter removal.

¹ Programa de Engenharia Química, COPPE, Universidade Federal do Rio de Janeiro, Brasil.

² Departamento de Engenharia Ambiental, Programa de Pós-graduação em Engenharia Sanitária e Ambiental, Universidade Estadual do Centro-Oeste do Paraná (Unicentro), Brasil.

*Autor correspondente: Programa de Engenharia Química, COPPE/UFRJ, Centro de Tecnologia - Rua Horácio Macedo, Bloco G, 2030 - 101 - Cidade Universitária da Universidade Federal do Rio de Janeiro, Rio de Janeiro - RJ, CEP 21941-450. Email: neandersongalvao@gmail.com

REVISTA AIDIS

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

DESEMPENHO ENERGÉTICO E TRATAMENTO DE ÁGUA RESIDUÁRIA EM FOTOBIOREATOR CONTÍNUO ILUMINADO ARTIFICIALMENTE

* Raquel Gomes de Oliveira¹

Fábio Vassoler¹

Aníbal da Fonseca Santiago¹

ENERGY PERFORMANCE AND WASTEWATER TREATMENT IN AN ARTIFICIALLY ILLUMINATED CONTINUOUS PHOTOBIOREACTOR

Recibido el 4 de noviembre de 2018; Aceptado el 5 de febrero de 2020

Abstract

The use of Light Emitting Diodes (LEDs) as a light source have important advantages: high efficiency, high durability and low energy consumption. LEDs can be applied to the illumination of photobioreactors used in the treatment of wastewater for the removal of organic matter, nutrients and pathogens. Most of the research found in the literature makes use of laboratory-scale photobioreactors (usually 1L) and operated in batch mode. Despite the low energy consumption of the LEDs, its use for continuous photobioreactors is questioned, since the energy performance for these systems has not yet been evaluated. Microalgae are cultivated in photobioreactors and, besides promoting the treatment of wastewater, their biomass can be reused to generate different bioproducts. This research evaluated the efficiency of an open photobioreactor illuminated by LED, simulating the operation of a High Rate Algal Pond (HRAP), in the treatment of synthetic wastewater and in the energy aspect as a function of artificial light. The light intensity was $815 \mu\text{E}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$. The system was operated continuously under a 7-day hydraulic retention time (HRT). Microalgae productivity was $6.80 \pm 1.9 \text{ g}\cdot\text{d}^{-1}\cdot\text{m}^{-2}$, and the net oxygen production was $0.83 \text{ g}\cdot\text{L}^{-1}$. The system presented stability and efficiency in the removal of organic matter, represented by Chemical Oxygen Demand (COD), being $90.3 \pm 1.7\%$ of removal. However, high values of energy consumption indicators were obtained, being $368.8 \text{ kWh/kg COD removed}$, $287 \text{ kWh}\cdot\text{m}^{-3}$ and $51.66 \text{ kWh (hab.d)}^{-1}$.

Keywords: environmental technologies, high rate algal pond, microalgae.

¹ Departamento de Engenharia Civil, Universidade Federal de Ouro Preto, Brasil.

* Autor correspondente: Departamento de Engenharia Civil, Universidade Federal de Ouro Preto, Morro do Cruzeiro, s/n – Escola de Minas – Bauxita, Ouro Preto, Minas Gerais. 35400-000. Brasil. Email: raqgoliveira@gmail.com

REVISTA AIDIS

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

MODELAGEM HIDRODINÂMICA E AVALIAÇÃO DO DECAIMENTO DO FÓSFORO EM UM LAGO URBANO HIPEREUTRÓFICO

Sofia Midauar Gondim Rocha¹
Janine Brandão de Farias Mesquita²
* Iran Eduardo Lima Neto¹

HYDRODYNAMIC MODELING AND PHOSPHORUS DECAY EVALUATION OF A HYPEREUTROPHIC URBAN LAKE

Recibido el 8 de noviembre de 2018; Aceptado el 28 de junio de 2019

Abstract

This study aimed to analyze the hydrodynamics of a hypereutrophic urban lake located in Fortaleza-CE, Brazil, applying the 2D modeling software CE-QUAL-W2, as there is a lack of these studies on the Northeast region of Brazil. Field data along with literature available information were used to insert lake information on the model, so the scenarios for rainy and drought periods were performed for velocity, temperature and residence time (RT). Time series for RT and phosphorus decay rate (K) were performed and compared to the results found using the complete mixing approach. The modeling outcomes showed RT values on the range from 8 to 80 days, with higher values obtained for the dry season, as expected. It was also observed a slight thermal stratification for the dry season, which reduces for the rainy season. This scenario was corroborated by the results regarding the RT. Finally, when the RT and K values obtained with the 2D model were compared to the ones obtained with the complete mixing approach, it was found that this is a good approximation for this reservoir.

Keywords: CE-QUAL-W2, hydrodynamic modeling, urban lake, phosphorus.

¹ Centro de Tecnologia, Campus do Pici, Departamento de Engenharia Hidráulica e Ambiental, Universidade Federal do Ceará, Brasil.

² Universidade Federal do Ceará, Campus Crateús, Brasil.

* *Autor correspondente:* Universidade Federal do Ceará, Departamento de Engenharia Hidráulica e Ambiental, Centro de Tecnologia, Campus do Pici, Av. Mister Hull s/n, Bloco 713, 1º andar, 60451-970 Fortaleza, CE, Brazil. Email: iran@deha.ufc.br

REVISTA AIDIS

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

ANÁLISE SITUACIONAL DAS CONDIÇÕES SANITÁRIAS DOS DOMICÍLIOS DAS FAMÍLIAS QUILOMBOLAS REGISTRADAS NO CADÚNICO, 2016

* Kasandra Isabella Helouise Mingoti Poague¹
Uende Aparecida Figueiredo Gomes¹

SITUATIONAL ANALYSIS OF THE SANITARY CONDITIONS OF THE REGISTERED QUILOMBOLA FAMILIES IN CADÚNICO, 2016

Recibido el 8 de noviembre de 2018; Aceptado el 28 de junio de 2019

Abstract

The present study aimed to develop a situational analysis of the sanitary conditions of the houses of the quilombola families registered in the Cadastro Único for Social Programs of the Federal Government (CadÚnico). For this purpose, the CadÚnico family database for the year 2016 was employed, available by the former Ministry of Social Development, now the Ministry of Citizenship. Descriptive statistical analyzes of five variables related to basic sanitation and one socioeconomic variable were carried out. The results show that the main form of water supply for the quilombola families is through wells or springs (45.29%), there is still a large portion of households that don't have channeled water (44.99%), bathroom or toilet (28.64%), and adequate destination of domestic sewage (7.85% have open sewage and 60.18% use rudimentary latrine), the household waste collection service doesn't exist in 70.58% of the households, and most of the residents burn or bury the waste in the soil. It was observed that a large portion of families lived in extreme poverty (71.82%). Comparing the results by locality (urban or rural) it is observed that there is a clear asymmetry access to basic sanitation services, being the best condition in urban locations. Families living in the North and Northeast regions are those who live with the worst sanitation conditions and should be prioritized as the focus of interventions. Thus, the present study indicates that even with the aid of government programs and public policies, a large part of quilombola families still live with inadequate sanitary conditions.

Keywords: public policy, quilombolas, sanitation.

¹ Departamento de Engenharia Sanitária e Ambiental, Universidade Federal de Minas Gerais, Brasil.

* *Autor correspondente:* Departamento de Engenharia Sanitária e Ambiental, Universidade Federal de Minas Gerais. Av. Antônio Carlos, 6627/Escola de engenharia, Bloco 1, 4o andar – Pampulha, Belo Horizonte, Minas Gerais. CEP.:31270-901. Brasil. Email: poaguek@gmail.com

REVISTA AIDIS

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

INTERFACE GRÁFICA SOB A UTILIZAÇÃO DA LÓGICA FUZZY: A QUALIDADE DE ÁGUA EM RESERVATÓRIOS

GRAPHIC INTERFACE UNDER THE USE OF FUZZY LOGIC: WATER QUALITY IN RESERVOIRS

Paulo Henrique Pereira Borges¹
* Halana Karine Dias dos Santos¹
Camila Santiago Martins Bernardini²
Ingrid Fernandes de Oliveira Alencar¹
Débora Carla Barboza de Sousa¹
Raquel Jucá de Moraes Sales¹

Recibido el 10 de noviembre de 2018; Aceptado el 10 de octubre de 2019

Abstract

The scarcity of rainfall in several Brazilian regions, associated with long periods of drought and high evaporation rates, currently challenges water management models. The mathematical models of water quality are an alternative to improve the control of the management of these resources. Aiming at establishing a computational program that provides model responses, the research aims to develop a graphical interface capable of allowing data entry in the system in a simple and intuitive way, together with graphical tools to quickly analyze the processed data. Methodologically, Fuzzy logic was used for data processing and interface construction, in order to study the water quality in reservoirs. As a result, a quick and objective interface was obtained, combined with the analysis of results by means of graphs. It is concluded that the presented interface has feasibility of implementation, since it gives greater agility, practicality and greater amplitude in the analysis of the obtained results.

Keywords: interface, mathematical model, water quality.

¹ Universidade de Fortaleza (UNIFOR), Brasil.

¹ Universidade Federal do Ceará (UFC), Brasil.

*Autor Correspondente: Universidade de Fortaleza, Av. Washington Soares, 1321, Salinas, Fortaleza/Ceará. Código Postal: 60811-905. Brasil. Email: halanakarine1@gmail.com

REVISTA AIDIS

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

ANÁLISE COMPARATIVA DE TÉCNICAS DE DESINFECÇÃO EM EFLUENTE DE ETE UTILIZANDO MICRORGANISMOS INDICADORES

* Thaís Kovalski¹
Carlos Raphael Pedroso¹
Jeanette Beber de Souza¹
Grasiele Soares Cavallini²

COMPARATIVE ANALYSIS OF DISINFECTION TECHNIQUES IN WASTEWATER OF ETE USING MICROORGANISM INDICATORS

Recibido el 21 de noviembre de 2018; Aceptado el 30 de abril de 2020

Abstract

This study evaluated the efficiency of individual disinfection methods using peracetic acid (PAA), hydrogen peroxide (H_2O_2) and UV radiation and the combined disinfection methods of PAA/UV and H_2O_2 /UV for final effluent of wastewater treatment plant. It was evaluated the performance of the disinfectants used according to the inactivation efficiency of the indicator microorganisms, *Escherichia coli*, total coliforms, *Clostridium perfringens* and coliphages. To the experimental conditions adopted, the concentrations of PAA and H_2O_2 were 2 and 3 mg L⁻¹ and contact time of 10 and 20 minutes, with mean exposure doses ranging from 30.62 to 206.65 mWs.cm² for UV radiation. The PAA/UV and H_2O_2 /UV disinfection consisted of a combination of the times, concentrations and doses of disinfectants adopted in individual methods. The results obtained in the disinfection tests with peracetic acid and hydrogen peroxide did not promoted significant inactivations for any of the indicator microorganisms, under the experimental conditions employed. The UV radiation showed to be more effective in the reduction of all the indicator microorganisms, showing superior results compared to the other disinfectants. The disinfection processes PAA/UV and H_2O_2 /UV showed similar inactivations to those obtained by UV radiation method. *Clostridium perfringens* was the microorganism that showed higher resistance to inactivation for all disinfectants used. The occurrence of synergism was observed for *Escherichia coli*, *Clostridium perfringens* and coliphages, only in the concentrations and times of superior contacts. There was a significant increase of 1 log of inactivation for *C. perfringens*, when combined H_2O_2 /UV disinfection method was used.

Keywords: advanced oxidative processes, hydrogen peroxide, peracetic acid, UV radiation, synergism.

¹ Departamento de Engenharia Ambiental, Universidade Estadual do Centro-Oeste, Brasil.

² Universidade Federal do Tocantins, Brasil.

* *Autor correspondente:* Departamento de Engenharia Ambiental, Universidade Estadual do Centro-Oeste. PR 153, Km 7, s/n – Riozinho, Irati, Paraná. 84500000. Brasil. Email: thaiskovalski.ambiental@gmail.com

REVISTA AIDIS

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

OZONIZAÇÃO E ARRASTE DE GASES NO PÓS-TRATAMENTO DE EFLUENTE SANITÁRIO

Raíssa Faria de Araújo¹

* Marcio Ricardo Salla¹

Alessandra Maysa Araújo Rodrigues²

OZONIZATION AND GAS STRIPPING IN POST-TREATMENT OF SANITARY EFFLUENT

Recibido el 2 de diciembre de 2018; Aceptado el 30 de abril de 2020

Abstract

The paper of the experimental objective focused on the post-treatment of sanitary effluent through ozonation and gas stripping by the bubbling of pure nitrogen, aiming at the removal of organic compounds. The sanitary effluent matrix comes from a sewage treatment plant that uses the UASB (Upflow Anaerobic Sludge Blanket) reactor as a secondary treatment followed by flocculation/flotation in a Flot-Flux type channel. As for the experimental configuration, in the ozonation were applied loads of 2.07, 5.38 and 7.15 gO₃/h (surface application rates of 127.4, 382.2 and 636.9 L/min.m², respectively) in a bubbling column to the contact times between the ascending bubbles and the liquid medium of 30 and 60 minutes. The same experimental configurations were adopted in the experiments of gas stripping from the injection of the inert gas N₂. In the ozonation and gas stripping, respectively, there was an increase in pH values (10.4% ± 2.2 and 20.2% ± 1.0) and reductions in color (89.1% ± 4.1 and 42.4% ± 6.9), turbidity (68.3% ± 9.8 and 36.5% ± 18.6), COD (70.1% ± 8.9 and 35.5% ± 7.4) and ammoniacal nitrogen (10.8% ± 1.5 and 9.3% ± 0.5) parameters; however, nitrate was only raised in the ozonation tests (on the order of 6 times), remaining constant in the gas stripping. Statistical analysis Anova states that the analyzed parameters were not influenced by injected gas dosages, but only by contact times. Ozonation was able to promote the removal of organic compounds in the post-treatment of sanitary effluent, while the gas stripping technique was able to remove volatile organic compounds and free ammonia.

Keywords: gas stripping, sanitary effluent, ozonation, post-treatment.

¹ Programa de Pós-graduação em Engenharia Civil, Universidade Federal de Uberlândia, Brasil.

² Faculdade de Engenharia Ambiental, Universidade Federal de Uberlândia, Brasil.

* *Autor correspondente:* Programa de Pós-graduação em Engenharia Civil, Universidade Federal de Uberlândia, Avenida João Naves de Ávila, 2121, Santa Mônica, Campus Santa Mônica, bloco 1Y - sala 237, CEP 38400-902, Uberlândia, Minas Gerais, Brasil.
Email: marcio.salla@ufu.br

REVISTA AIDIS

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

USO DE PLAGUICIDAS E INTOXICACIONES AGUDAS EN LA POBLACIÓN RURAL DE SAN BALTAZAR CHICHICÁPAM, OAXACA, MÉXICO

Mitzy Karen Rodríguez Bornios¹

Denisse Zavaleta Silva¹

Honorio Torres Aguilar¹

Leobardo Reyes Velasco¹

* Héctor Ulises Bernardino Hernández¹

USE OF PESTICIDES AND ACUTE POISONING IN RURAL POPULATION OF SAN BALTAZAR CHICHICAPAM, OAXACA, MEXICO

Recibido el 19 de diciembre de 2018; Aceptado el 30 de abril de 2020

Abstract

In Oaxaca, agriculture is the main activity in the primary sector and in rural communities. Unfortunately, agricultural production is exposed to the indiscriminate use of agricultural inputs, in particular, to pesticides. These inputs represent a potential risk to public health and the environment. The objective of this research was to document the management, use behaviors and acute poisoning caused by pesticides used in agriculture in the community of San Baltazar Chichicápam, Oaxaca, Mexico. Through surveys to 50 producers, information was obtained on the types of crops and pesticides used, the behaviors of use, as well as the signs and symptoms of acute pesticide poisoning (APP). The most important crops were corn and beans (78%), alfalfa (68%), chickpea (28%), tomato (20%) and flowers (20%). We identified 37 active ingredients (IA) of pesticides, 17 are used in corn, 15 in beans, 15 in alfalfa, 23 in tomato and 12 in flowers. The organophosphorus insecticide methamidophos of Toxicological Category II (TC II), is applied mainly in corn, beans and alfalfa. In the rest of the crops, insecticides, herbicides and fungicides of different TCs are used. Most farmers do not use safety measures when using pesticides. 66% of the population have at least one APP symptom. The main pesticide associated with these symptoms was methamidophos. The health of the population under study is at risk due to exposure to the diversity of pesticides identified.

Keywords: acute pesticide poisoning, Chichicapam, Oaxaca, pesticides.

¹ Facultad de Ciencias Químicas, Universidad Autónoma Benito Juárez de Oaxaca, México.

* *Autor correspondiente:* Facultad de Ciencias Químicas, Universidad Autónoma Benito Juárez de Oaxaca. Av. Universidad S/N, Cinco Señores, C.P. 68120, Oaxaca, Oax. México. E-mail: hbernardino@yahoo.com

REVISTA AIDIS

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

ISOLAMENTO E CARACTERIZAÇÃO MORFOLÓGICA DE MICRORGANISMOS PRESENTES NO PROCESSO DE COMPOSTAGEM DE RESÍDUOS DE ORIGEM VEGETAL

Ana Paula de Jesus Santos¹
Diane Cordeiro Araújo¹
Agnes Kiesling Casalli¹
Fabiana Ribeiro Viana²
* Marcos Paulo Gomes Mol²

ISOLATION AND MORPHOLOGICAL CHARACTERIZATION OF MICROORGANISMS PRESENT IN THE PROCESS OF COMPOSTING LEAF WASTES

Recibido el 20 de diciembre de 2018; Aceptado el 7 de septiembre de 2019

Abstract

The management of urban solid waste (USW) represents a major environmental problem nowadays. Composting is one of the proposed solutions to make possible the reuse of part of the organic waste, constituting a controlled aerobic process, developed by a diverse population of microorganisms. The temperature is an important factor that interferes in the continuity of the microbial populations and its it may indicate the phases of degradation. The identification of the microorganisms present in composting is an important step to identify those more efficient, allowing a better control of the process and consequent better efficiency. Therefore, the present study aims to isolate and characterize, from morphological and phenotypic criteria, the microorganisms present in the final product of a leaf compost. The microorganisms were isolated from the final product of this composting process (pilot scale), carried out in a public institution in Belo Horizonte, Brazil. Selective and nonselective culture medium were used to obtain a greater possible variety of microorganisms. For the morphological evaluation of the plants a Gram staining technique was used. Of the analyzed samples, 44% are Gram positive bacilli, 22% Gram negative rods, 6% Gram positive cocci, 28% Gram negative cocci. The predominant aerobic bacteria found were those belonging to the genus bacillus spp., indicating the relevance of these microorganisms for the accomplishment of the composting process. New studies are needed to effect the identification of the species present in the processes of leaf wastes composting and the characterization of the biotechnological potential of these bacteria.

Keywords: organic compost, decomposition, efficient microorganisms.

¹ Centro Universitário UMA, Brasil.

² Diretoria de Pesquisa e Desenvolvimento da Fundação Ezequiel Dias, Brasil.

*Autor correspondente: Divisão de Ciência e Inovação, Diretoria de Pesquisa e Desenvolvimento. Fundação Ezequiel Dias – FUNED. Rua Conde Pereira Carneiro, 80. Bairro Gameleira. Cidade Belo Horizonte. Estado Minas Gerais. Código Postal (CEP) 30510-010. Brasil. Telefone: +55 31 3314-4770. E-mail: marcos.mol@funed.mg.gov.br

REVISTA AIDIS

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

ANÁLISE DE SISTEMAS DE TRATAMENTO DE EFLUENTES DE ABATEDOUROS BOVINOS POR LAGOAS DE ESTABILIZAÇÃO E POR REATOR UASB SEGUIDO DE LAGOA DE POLIMENTO

* Patrick Lucas Iopp¹
Alesi Teixeira Mendes²

ANALYSIS OF SYSTEMS OF TREATMENT OF EFFLUENTS OF BOVINE LAYERS BY ESTABLISHMENT LAKES AND BY UASB FOLLOWED REPLACER OF POLISH POND

Recibido el 21 de diciembre de 2018; Aceptado el 30 de abril de 2020

Abstract

Brazil is among the largest beef producers in the world and this industrial sector has a fundamental role in the country's economy. It's notorious that the activities carried out in the slaughterhouses have a high polluting potential of the water bodies, where the generated effluents are released. The treatment of these effluents can be carried out by combining chemical, physical and biological methods. After treatment, the effluent characteristics must comply with the parameters established by current legislation. The objective of this work is to evaluate and analyze the efficiency of two treatment systems of the effluent generated by a slaughterhouse in the state of Tocantins, the first being the traditional system of stabilization ponds and the second consisting of a UASB reactor and a polishing pond. The estimated BOD removal efficiency for the proposed systems was over 90%, above the 60% efficiency required by CONAMA Resolution No. 430 and, therefore, applicable to the treatment of slaughterhouse effluents.

Keywords: anaerobic treatment, organic matter, industrial waste, UASB reactor, stabilisation ponds.

¹ Universidade Federal do Tocantins (UFT), Brasil.

¹ Programa de Pós-graduação de Engenharia Ambiental, Universidade Federal do Tocantins (UFT), Brasil.

*Autor correspondente: Universidade Federal do Tocantins, 105 Norte, alameda das Aroeiras, 5 – Plano Diretor Norte, Palmas - TO, 77001-048 – Brasil. Email: patrickliopp@gmail.com; patrick_iopp@mail.uft.edu.br

REVISTA AIDIS

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

COMPOSTO ORGÂNICO OBTIDO POR PROCESSO DE COMPOSTAGEM DE LODO DE ESGOTO COM INOCULAÇÃO DE BIORREMEIADOR

* Welliton Leandro de Oliveira Boina ¹

João Sérgio Cordeiro ¹

Roberto Lyra Villas Bôas ²

Rosane Freire Boina ³

ORGANIC COMPOUND OBTAINED BY THE PROCESS OF COMPOSTING OF SEWAGE SLUDGE WITH INOCULATION OF BIORREMEIADOR

Recibido el 1 de octubre de 2019; Aceptado el 31 de enero 2020

Abstract

In order to facilitate and accelerate the process of waste Bio-oxidation to obtain products with better quality, stabilized and sanitized, several effective microorganism-based bioremediators are available. The efficiency of the bioremediator may vary according to the type of waste and bioxidation process used. However, its use and effectiveness can be considered contradictory, not presenting standardization of responses to similar situations. The purpose of this study was to analyze and compare the organic compound formed by composting process in the presence and absence of the biorremediaodor inoculation in sewage sludge from an anaerobic treatment. The results showed that the bioremediator in the composting process is more useful in occasions when the microorganisms used are compatible with the characteristics of the residue, so in this study there was no evidence of acceleration of the composting process.

Keywords: biorremediador, composting, inoculant, organic compound, sewage sludge.

¹ Departamento de Engenharia Civil, Universidade Federal de São Carlos, Brasil.

² Departamento de Solos e Recursos Ambientais, Universidade Estadual Paulista, Faculdade de Ciências Agronômicas, Brasil.

³ Departamento de Química e Bioquímica, Universidade Estadual Paulista; Faculdade de Ciências e Tecnologia, Brasil.

*Autor correspondente: Rua Yosiko Akamine, n. 268, Parque Santa Clara, Presidente Prudente-SP, CEP: 19025-566, Brasil.

Email: weboina@gmail.com