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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. 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.

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UM NOVO MODELO DE FOTOBIORREATOR TUBULAR HELICOIDAL PARA PRODUÇÃO DE MICROALGAS

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Carlos Nobuyoshi Ide¹
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Marc Árpád Boncz¹

A NEW MODEL OF HELICAL TUBULAR PHOTOBIOREACTOR FOR THE MICROALGAE PRODUCTION

Recibido el 25 de enero de 2017; Aceptado el 4 de mayo de 2018

Abstract

Microalgae have been used as feedstock for many high value-added products. However, some problems have been observed during its production. The high cost, low efficiency and ease of contamination are some of the factors that has hampered the production. This study aimed to develop a new helical tubular photobioreactor model, in pilot-scale, artificially and internally illuminated, more efficient, simpler and potentially more economical. From the daily monitoring of the microalgae growth for turbidity and total suspended solids, it was concluded that the helical photobioreactor proposed has a high microalgae production capacity in a short time and also a low cost of installation and operation. However, the proposed reactor still depend on a substantial energy consumption for cooling due to overheating.

Keywords: *Chlorella* sp., microalgae cultivation, technologic innovation.

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**ADSORÇÃO DE MICROCISTIN-LR POR
CARVÃO ATIVADO GRANULAR
PRODUZIDO A PARTIR DE CASCA DE COCO
DE DENDÊ**

*Wilton Silva Lopes'
Sátiva Barbosa de Brito Lélis Villar'
Railson de Oliveira Ramos'
Beatriz Susana Ovruski de Ceballos'
Valderi Duarte Leite'
José Tavares de Sousa'

**ADSORPTION OF MICROCYSTIN-LR BY GRANULAR
ACTIVATED CARBON PRODUCED FROM PALM
(DENDÊ) COCONUT SHELLS**

Recibido el 7 de febrero de 2017; Aceptado el 22 de febrero de 2018

Abstract

The effects of initial concentration of microcystin-LR (14.56 and 29.26 $\mu\text{g.L}^{-1}$), pH of influent solution (6.4 and 8.3) and adsorbate / adsorbent contact time (60 and 90 s) on the adsorption of cyanotoxin by granular activated carbon (GAC) was studied. GAC produced from palm (coconut shells) was highly efficient (between 88 - 92%) in removing microcystin-LR from aqueous solution, and concentrations of cyanotoxin in treated effluents were below the maximum level (1 $\mu\text{g.L}^{-1}$) permitted By Brazilian legislation. The variables initial concentration of toxin and contact time exerted strong effects on adsorption, while the influence of pH was much weaker.

Keywords: water treatment; cyanotoxins; *M. Aeruginosa*; adsorption; granular activated carbon.

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AVALIAÇÃO DA PERCEÇÃO AMBIENTAL DE UMA CIDADE POR MEIO DE INDICADORES DE CONHECIMENTO, IMPORTÂNCIA E COMPORTAMENTO

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EVALUATION OF THE ENVIRONMENTAL PERCEPTION OF A CITY THROUGH INDICATORS OF KNOWLEDGE, IMPORTANCE AND BEHAVIOR

Recibido el 16 de febrero de 2017; Aceptado el 6 de noviembre de 2017

Abstract

The aim of this paper is to present a study of environmental perception measurement focused on socioeconomic and environmental sustainability in a city of Rio Grande do Sul, in order to contribute to the understanding of how an individual, or a group of people realizes the environment in which they lives. The method was developed in the Passo Fundo city, based on the application of a questionnaire that evaluated the knowledge, behavior and importance that the habitants give in relation to solid waste, transportation, urban planning and energy. In total, 386 habitants were interviewed. The results show that the population of Passo Fundo attributes to the environmental issues addressed in this instrument a High Importance, has a Medium knowledge and a Moderate environmental pro-environmental behavior. Finally, the General Environmental Perceptions Index obtained was Moderate.

Keywords: ecological behavior, enviromental education, measurement scales, sustentaible development.

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POTENCIALIDADE ENERGÉTICA E QUALIDADE DO BIOFERTILIZANTE PRODUZIDO EM BIODIGESTÃO DE RESÍDUOS SÓLIDOS PUTRESCÍVEIS DE RESTAURANTE UNIVERSITÁRIO

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ENERGY CAPABILITY AND QUALITY OF BIO- FERTILIZERS PRODUCED IN THE BIODIGESTION OF PUTRESCIBLE SOLID WASTE FROM A UNIVERSITY RESTAURANT

Recibido el 23 de febrero de 2017; Aceptado el 22 de febrero de 2018

Abstract

The accumulation of solid waste produced by society represents today one of the main environmental impacts encountered. They are usually arranged in landfills that, if not operated almost like dumps, are systems that don't take advantage of the biogas generated. The present work conducted the assessment of biogas and bio-fertilizers produced from a biodigester which operates in batch. Five tests were conducted, under mesophilic conditions, where the biodigester was fed with the readily biodegradable organic fraction of solid waste produced in a university restaurant. During the tests, the average organic loading rate was 30.4 ± 15.1 g VTS/day.m³. The biofertilizer produced presented pH between 7.9 and 8.6. The total organic carbon was 13.4% and average total nitrogen in 0.24%, i.e. average ratio of 58:1. The proportion that presented the best results was 2:1 (batch 5), with production of 2.416.12 NL of biogas. The biogas generated presented average content of methane of 77.8%, being estimated, in case of use of biogas in the digester's own operation, a positive energy balance of 1.21 kWh.

Keywords: biofertilizers, biogas, solid waste, anaerobic digestion, biodigester.

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CARACTERIZAÇÃO FÍSICA DOS RESÍDUOS SÓLIDOS DOMICILIARES DO MUNICÍPIO DE ROLIM DE MOURA - RONDÔNIA - BRASIL

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PHYSICAL CHARACTERIZATION OF DOMICILIARY SOLID WASTE OF CITY ROLIM DE MOURA - RONDÔNIA - BRAZIL

Recibido el 23 de febrero de 2017; Aceptado el 22 de junio de 2018

Abstract

In Brazil, the rate of municipal solid waste generation is greater than the rate of population growth, and the willingness of almost half of the waste is still done improperly. In the small towns of the country the reality is no different, but technical data on the characteristics of the waste produced are scarce, thus hindering their knowledge and choice of effective management alternatives. Thus, this study aims to determine the main physical characteristics of the domiciliary solid waste generated in the municipality of Rolim de Moura – Rondônia – Brazil in the year 2014, as follows: the generation per capita, density, gravimetric composition and moisture content. The calculation of the per capita generation of waste was given by determining the weekly generation, obtained campaigns by weighing conducted in the city. The density, the gravimetric composition and the moisture content were determined from representative samples of the waste collected in routes Centro, Jardim Tropical and São Cristóvão. The domiciliary solid waste showed per capita generation a mean $0.607 \text{ kg.inhabitant}^{-1}.\text{day}^{-1}$, an average density of 143.26 kg.m^{-3} and a composition comprising: 44.9% of organic material, 38.7% of material suitable for recycling and 16.4% of other types of materials. The results of this study can contribute significantly to the local bodies responsible for the management of municipal solid waste to adopt efficient strategies and actions.

Keywords: density, gravimetric composition, moisture content, per capita generation.

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WASTE MANAGEMENT ALTERNATIVES IN URBAN AND RURAL QUILOMBOLA COMMUNITIES

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Recibido el 28 de marzo de 2017; Aceptado el 16 de octubre de 2018

Abstract

Quilombolas are descendants from black slaves who founded isolated communities, the Quilombos. Many of these communities have considerable needs, especially because most are located in rural areas, including waste management, which affects their health and requires studies in the area. Based on this, this paper shows the current conditions of waste management in two quilombola communities, urban and rural, through site visits, questionnaires and gravimetric analyses. Therefore, it was possible to notice that the urban community has better conditions than the rural community, and their 66% of organic matter and 17% of plastics and paper are equivalent to the gravimetric composition of the city in which it is inserted. In the rural community, almost 90% of plastics and paper are burned in the ground and 100% of organic matter, from food, is destined to domestic animals and used as fertilizer. For this reason, the rural community presented a higher generation of plastics and glass in the gravimetric analyses. In conclusion, it is suggested for both communities to perform source separation. In addition, composting for the rural community is recommended. This will improve the sustainability of waste management in both locations. It was also concluded that the conditions of these communities depend on the urban context that they are inserted in, as well as their culture.

Keywords: Brazil, Quilombola, Solid Waste Management, urban community, rural community.

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AVALIAÇÃO DO PROCESSO DE COMPOSTAGEM DE RESÍDUOS DE FOLHAS DE ÁRVORES E JARDINS EM UMA INSTITUIÇÃO PÚBLICA DE BELO HORIZONTE (BRASIL)

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EVALUATION OF THE COMPOSTING PROCESS REUSING LEAVES AND YARD WASTE IN A PUBLIC INSTITUTION OF BELO HORIZONTE, BRAZIL

Recibido el 12 de julio de 2017; Aceptado el 11 de diciembre de 2017

Abstract

Considering a context of sustainable development and circular economy recyclable, organic and yard waste are considered resources and as potential new products. Yard waste, in general, show a slower decomposition, when it isn't used in a composting process. This study aims to evaluate a composting process in a public institution of Belo Horizonte, Brazil, through the reuse of leaves and yard waste. The following indicators were measured: temperature (monitored daily), pH and moisture (monitored weekly). The final product showed characteristics of maturation after about 60 days. It was obtained a variation of temperature between 32 and 58°C and an average moisture of 54.9% ($\pm 5.4\%$) during the whole process. Analytical assays for pH were done using the solutions of Potassium chloride, Calcium chloride and type I Water, identifying the average values 7.38 (± 0.20), 7.45 (± 0.28) and 8.35 (± 0.45), respectively. Obtained results indicated that the factors affecting decomposition, used in the present study (pH, temperature, moisture) maintain within a range that allowed adequate degradation of the compost during the monitored period. Furthermore, due the simple maintenance of the process and reduce of materials that would be send to landfills, it was concluded that the composting of leaves and yard waste is viable and recommended as an improvement in waste management in enterprises that has the challenge to manage this kind of waste.

Keywords: biodegradation, composting, leaf waste, waste management.

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UN ESTUDIO SOBRE VULNERABILIDAD Y RESILIENCIA SOCIAL EN POBLACIONES DE ALTO RIESGO A INUNDACIONES EN EL ESTADO DE VERACRUZ

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A STUDY ON SOCIAL VULNERABILITY AND RESILIENCE IN HIGH-RISK POPULATIONS TO FLOODING IN THE STATE OF VERACRUZ

Recibido el 14 de junio de 2017; Aceptado el 8 de junio de 2018

Abstract

Dozens of municipalities have been affected in recent years by hurricanes and tropical storms. Although these events respond to a seasonal cycle, their probability of occurrence and intensity is increasingly linked to climate change. This proposal presents the principal findings of a research in three municipalities that have been affected by flooding in the state of Veracruz: Tlacotalpan, La Antigua and Cotaxtla. It seeks to know and help strengthen the social skills of the population to increase their resilience. This from the characterization of community practices and how they affect the vulnerability associated with hydrometeorological phenomena aggravated by climate change. It is expected to define criteria and guidelines for action, ranging from environmental education, to help reduce their risks and those of other communities in similar conditions. We worked with representative sampled of high school students from each municipality among whom a survey was applied. Moreover, semistructured interviews of key players were conducted at each site: mayors, principals of high schools, civil defense personnel, mainly. It was decided to work with young people because they know the customs of the community and are proactive; then, they can be agents of change to their families and the rest of the population. One of the particular interests was to identify youth with natural leadership that can lead to civil protection groups promoting intra and inter-linkages for strengthening solidarity and reciprocity.

Keywords: climate change, risk populations, environmental education.

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CREENCIAS EPISTEMOLÓGICAS SOBRE EL CAMBIO CLIMÁTICO EN DOCENTES. UN INSTRUMENTO METODOLÓGICO A FAVOR DE LA EDUCACIÓN AMBIENTAL

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EPISTEMOLOGICAL BELIEFS ON CLIMATE CHANGE IN TEACHERS. AN INSTRUMENT IN FAVOR OF ENVIRONMENTAL EDUCATION

Recibido el 15 de julio de 2017; Aceptado el 15 de mayo de 2018

Abstract

Environmental problems derive from others of very different order and composition, are not always considered complex when possible solutions are offered. Often, in primary schools, actions are adopted that at best only simulate an exercise in response to an environmental problem, in many cases such actions become more part of the problem than of the solution. For this reason, each environmental problem must be analyzed from a complex thinking to obtain a broad, plural and pertinent understanding, which entails establishing actions that articulate different disciplines to contribute first to their understanding and thus be able to act accordingly looking for possible Solutions. To make consistent contributions, teachers need to know through environmental education the complexity and interdisciplinarity of environmental problems. The identification of epistemological beliefs provides elements to contribute to the solutions of environmental problems from educational institutions. Here we present a study where the instrument TSEBQ (Topic Specific Epistemological Beliefs Questionnaire), which identifies with acceptable reliability the four dimensions of epistemological beliefs about climate change, was applied to primary level teachers.

Keywords: climate change, complexity, epistemological beliefs, environmental education, teachers.

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INFLUÊNCIA DAS MUDANÇAS CLIMÁTICAS, PROJETADAS PELO IPCC, NA ARIDEZ DO BRASIL

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INFLUENCE OF CLIMATE CHANGE, DESIGNED BY THE IPCC, IN THE BRAZIL ARIDITY

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Abstract

The objective of this work is to analyze how climatic changes may interfere in the climatic classification of the aridity index in Brazil, through impacts on the water availability of each region of the country. The projections of 14 CMIP5 models published in the fifth IPCC report were used for the RCP 4.5 and RCP 8.5 scenarios. The period analyzed was from 2010 to 2099, compared to the historical scenario from 1950 to 1999. The methodology consists of the temperature projections - which enabled the calculation of potential evapotranspiration (ETP) by the Hargreaves and Samani method - and precipitation, which enabled the calculation of the Aridity Index developed by Thornthwaite, with subsequent adjustment by Penman. The bias removal of the studied variables was done using the data observed by the Climatic Research Unit (CRU). The results related to the aridity index point to a change in the spatial distribution of climatic types in some of the regions of the country. The analyzes indicate, in both CPRs, the increase of arid zones in the NE and CO regions and the maintenance of the current climates for the other regions.

Keywords: Aridity index, climate change, IPCC.

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