

Assessment Of Toxicity Of Marine Sediment And Aromatic Hydrocarbon Samples Using Marine Algal Toxicity And Phytotoxicity Tests

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The aim of this study is to assess the toxicity of marine sediment and representative aromatic hydrocarbon samples on the growth of microalga *Phaeodactylum tricorutum* and the seed of *Sinapsis alba*. The methods employed for the toxicological evaluation involve physico-chemical analysis of the marine sediment, marine algal toxicity test using microalga *Phaeodactylum tricorutum* and phytotoxicity testing using *Sinapsis alba* (mustard seed). The results showed that both Abonema and Nembe waterside sediment samples had higher fractions of physico-chemical parameters than Onne sampled locations. Marine algal toxicity testing revealed that the positive control ($K_2Cr_2O_7$) had the highest EC_{50} value of 8.07 ± 0.03 mg/L with CV and r^2 values of 68.61% and 0.99 while pyrene Nembe sediment had the least EC_{50} value of 4.63 ± 0.01 mg/L with CV and r^2 values of 78.27% and 0.98 with very strong significant positive linear relationship between an algal number and sample concentrations ($P < 0.05$). The phytotoxicity testing also showed that the most inhibitory effect was produced by pyrene + Onne sediment sample with GI and CV values of $7.14 \pm 0.023\%$ and 0.37% while the least inhibitory effect was produced by xylene + distilled water sample with GI and CV values of $28.57 \pm 0.03\%$ and 0.18%. These observations revealed aquatic and terrestrial toxicity potentials of these test samples and prompt measures should be deployed to abate their menace in the Rivers State marine environment.

KEYWORDS

Acute toxicity, *Phaeodactylum tricorutum*, Aromatic hydrocarbons, *Sinapsis alba*, Marine sediment

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The 2019 Novel Coronavirus (COVID-19) Pandemic: A Blessing For Planetary Health Amidst Climate Crisis

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The emergence of severe acute respiratory syndrome coronavirus 2 in late December 2019 has led to the global outbreak of coronavirus disease (COVID-19). Due to its large infectivity and transmissibility, the spread of COVID-19 has put lives and livelihoods at risk. Even though the COVID-19 global outbreak has been termed a defining event, the wider implications have been felt for a longer period. In recent decades, there have been growing concerns within the health and environmental sectors due to climate emergency. Noticeably, there has been a marked increase in the frequency of extreme events, zoonotic diseases and climate-related disasters, posing a substantial threat to society while pushing them beyond their carrying capacity. Thus, the ongoing pandemic and climate crisis may have a tenuous causal association. Conversely, the outbreak has also emanated multiple positive environmental manifestations. The pandemic has resulted in cleaner air and water, along with a significant reduction in the emission levels while allowing wildlife and biodiversity to bounce back. The current study aims to assess the immediate and short-term effects of the pandemic while forecasting the medium and long-term impact on the global environment. The study explores the possibility of adopting a global blueprint using the concept of one health and planetary health for long-term sustainability. This study can be a great help for environmental scientists, policymakers and climate professionals to formulate environment responsive climate action plans in a post-pandemic world.

KEYWORDS

COVID-19, Pandemic, Environment, One health, Planetary health, Climate crisis

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Study Of The Influence Of Environmental Factors On Microbial Abundance In Various Ambient Conditions

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The objective of this study is to study the spatio-temporal dynamics of different bacterial populations of faecal origin (total aerobic mesophilic flora, faecal coliforms, total coliforms, faecal Streptococci and sulphite-reducing anaerobes) as a function of physico-chemical variables at the level of the Oued Larbaa and its tributaries. In order to illustrate the impact of physico-chemical parameters on the distribution of bacterial flora in this aquatic ecosystem, a multi-dimensional statistical study using principal component analysis (PCA) in combination with hierarchical ascending classification (HAC) was carried out during two different environmental conditions (summer and rainy season). Our results showed that the distribution of faecal microorganisms in the environment is most often influenced by environmental factors in the receiving environment, in particular biodegradable organic matter, dissolved oxygen, suspended solids, pH, temperature, as well as parameters indicative of water mineralization in terms of electrical conductivity, salinity, dry residues and total dissolved solids. These correlations established between bacterial loads and environmental factors significantly control the survival of these bacteria, which become more or less adapted to these environmental changes and maybe the cause of possible infection. This variation in the level of bacterial contamination is further accentuated by the input of raw domestic wastewater discharges and the practice of market gardening on the banks of this ecosystem, which is very much frequented by livestock and domestic animals.

KEYWORDS

Statistical analyses, Microbiological and physico-chemical pollution, Oued Larbaa and its tributaries, Northern Morocco

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Role Of Aeration On Vermicomposting Of Pre-Processed Vegetable Waste

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The bench-scale experimental study aims in accelerating the vermicomposting process by modifying the conventional vermicomposting into engineered vermicomposting. The acceleration was done by enhancing the vermi environment and encourage the worms to participate actively in the digestion process. The engineered process composes of pre-processing the waste and augmenting air artificially with airflow rate of 0.62 L/min in the Vermibin. The aeration was done in vertically elevated Vermibin with five different airflow durations (2 hr, 4 hr, 6 hr, 8 hr and 10 hr) by naming the bin as A1, A2, A3, A4 and A5, respectively. The optimum airflow duration was identified based on the substrate volume reduction and biomass growth in the Vermibin. In parallel, the nutrient status of vermicast also assessed, in order to characterize the vermicast generated in the reactors. Results reveal that 4 hr aeration with airflow rate of 0.67 L/min performance better and provide suitable environment for vermicomposting process.

KEYWORDS

Vermicomposting, Engineered vermicomposting, Biomass growth, Artificial aeration

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Utilization Of Agrowaste For Removal Of Octylphenoethoxylate And It's Impact On Adsorption Isotherm

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The present investigation explores the efficiency of low-cost agrowaste adsorbent for removal of octylphenoethoxylate surfactant from industrial wastewater. The stem of two aquatic weeds *Nelumbo nucifera* and *Typha latifolia* have been used as an adsorbent bed. They were named as non-carbonized *Nelumbo nucifera* (A), carbonized *Nelumbo nucifera* (B), non-carbonized *Typha latifolia* (C) and carbonized *Typha latifolia* (D). Biosorption capacity of these adsorbent beds was analyzed by pH meter and UV-Visible spectrophotometer. The efficiency of adsorption capacity of surfactant was validated by three adsorption isothermic models (Freundlich, Halsey and Jovanovic). The result show that regression coefficient (R^2) values of Jovanovic adsorption isotherm from pH meter were 0.942, 0.986, 0.930, 0.972 and from UV-Visible spectrophotometer were 0.979, 0.983, 0.969, 0.971 for the agrowaste A, B, C and D, respectively. These values are higher than the rest of the two isotherms. Adsorbent B showed higher values among all beds by both techniques. It indicates carbonized *Nelumbo nucifera* has more potential to interact with molecules of surfactant than the rest. Particle size of agrowaste was analyzed by SEM images, it showed bed B was more porous than other beds. FTIR spectra indicate the presence of functional groups of alkaloids and flavonoids in the adsorbent beds, which gives sites for adsorption of surfactants. Statistical analysis was done by single factor ANOVA considering significant value $p=0.01$. Thus, the removal of octylphenoethoxylate from the industrial wastewater maybe possible by the agrowaste, which is eco-friendly, chemical free and biodegradable in nature.

KEYWORDS

Freundlich adsorption isotherm, Halsey adsorption, Jovanovic adsorption isotherm, Regression coefficient, Biodegradable, *Nelumbo nucifera*, *Typha latifolia*

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Assessment And Spatial Distribution Of Groundwater Quality Index - A Case Study

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An experimental study on water quality index has been carried out to assess suitability of groundwater quality for drinking purposes in Cheyyeru watershed, YSR Kadapa district. This was done by subjecting groundwater samples from fourteen locations, to comprehensive physico-chemical analysis. Twelve parameters, namely pH, alkalinity, acidity, total hardness, calcium, magnesium, chlorides, nitrates, sulphates, electrical conductivity, total dissolved solids and bacteriological index have been considered for calculating the water quality index (WQI). The computed WQI shows that 15% of water samples fall in good quality category and 50% fall in moderate and rest in poor category which are not suitable for drinking purposes under normal conditions. High value of WQI is found due to the higher values of TDS, total hardness and sulphates. Factors influencing quality of groundwater were analyzed and found that improper landuse and land cover in the basin are the main contributing factors for poor quality of water.

KEYWORDS

Cheyyeru watershed, Water quality index, Landuse and land cover

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Biodegradation Of Diesel By *Pseudomonas stutzeri* DBT15 Strain Isolated From Contaminated Soil Of Mathura

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A bacterial strain was isolated from petroleum contaminated soil of Mathura. Total 5 soil samples were collected and 20 diesel-oil degrading bacteria were isolated. On the basis of different biodegradation capabilities of different bacterial species, *Pseudomonas stutzeri* DBT15 was selected using 2,6 dichlorophenol indophenol (DCPIP) assays. The biodegradation potential was evaluate by gravimetric method and residual oil was analyzed using gas chromatography/mass spectrometry (GC/MS) analysis. 96.18% of degradation was observed for M15 bacterial strain in 35 days of incubation by gravimetric analysis. Molecular characterization was performed by 16S rRNA nucleotide sequencing and it was identified as *Pseudomonas stutzeri* DBT15 strain.

KEYWORDS

GC-MS, *Pseudomonas stutzeri*, 2,6 dichlorophenol indophenols

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Assessing And Scoring The Corporate Sustainability Reports Of The Leading Indian Cement Companies Using GRI G4 Guidelines

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The global environmental and social issues have forced the corporate entities to pay attention to the social and environmental aspect of their business. Over the years, this concern witnessed a paradigm shift from traditional reporting of financial performance to non-financial performance as well. Majority of the companies utilize a comprehensive framework of the sustainability reporting in order to measure and disclose their non-financial performance based on the sustainability reporting guidelines. Sustainability reporting continues to be an evolving trend in India and is becoming a standard practise in order to compete with the global counterparts. This study aims to compare the sustainability reporting practices followed by big selected companies in the Indian cement industry. India is currently home to the world's 2nd largest cement market, both in terms of production and consumption. Cement has a heavy environmental footprint as the production of cement releases CO₂, as well as the production process consumes a lot of energy. Thus despite the popularity and profitability of the cement industry it is one of the highly polluting industries and contributes majorly to the global greenhouse gas emissions. In the backdrop of this, the current paper attempts to assess the sustainability performance of the leading companies in Indian cement industry and analyze their reporting trend on environmental, social and economic dimensions based on GRI G4 guidelines.

KEYWORDS

Sustainability, Sustainability reporting, Cement, GRI, Disclosure, Triple bottom line

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Physico-Chemical And Bacteriological Profile Of Effluents Collected From Electroplating Industries

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The present study was envisaged to the various physico-chemical and bacteriological properties of electroplating industrial effluents collected from GIDC estate of Vatva, Ahmedabad and GIDC estate of Kalol, Kalol. The various parameters, like pH, total dissolved solid (TDS), total suspended solids (TSS), ammonical nitrogen, fluoride, chloride, sulphate, phosphate, chemical oxygen demand (COD), biochemical oxygen demand (BOD), hardness, calcium, magnesium, sodium, alkalinity as CaCO_3 , total organic carbon (TOC) alongwith heavy metals, namely zinc, copper, nickel, iron, cadmium, lead and chromium were tested from electroplating industrial effluents. The comparison of various parameters of the effluents with standards prescribed by the Central Pollution Control Board (CPCB), results perceived that pH of inlet effluents were lower than standard pH range. TSS values were within the standard range. Phosphate was found higher than prescribed standards. However, heavy metals, like copper, nickel, iron and chromium were also present in higher concentration and these metals are very much toxic for environment. Thus, the electroplating effluents are dreadfully polluting the environment and entail proper treatment before disposal. From bacteriological study total 57 isolates were isolated, 30 isolates from Vatva GIDC electroplating industrial effluents and 27 isolates from Kalol GIDC electroplating industrial effluents. Out of 57 isolates 10 were found Gram (-ve) and 47 were Gram (+ve). Out of total isolates, 47 were found motile and 10 were found non-motile in nature. These isolates were morphologically characterized; five isolates B2, B7, B8, B10 and B17 were found to be morphologically distinct. The isolates were also screened in different parameters of biochemical and environmental condition, namely salt concentrations and temperature. These indigenous isolates can be used as a bioremediation purpose for removing heavy metals from the industrial effluents. The bioremediation of heavy metals using microorganisms has received a great deal of attention in recent years, not only as a scientific novelty but also for its potential application in industry.

KEYWORDS

Heavy metal contamination, Bioremediation, Electroplating industries, Electroplating effluents, Physico-chemical parameters, Bacteriological profile

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Comparison Of Effect Of Backwashing Methods On Overall Performance Of Rapid Sand Filter

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Almost all water treatment plants in India use sand filter to purify water. Air scouring followed by conventional back-washing of filter media is a common process followed. Recently, a huge amount of research is done across the world in the field of back-washing and its significance on the overall performance on a sand filter. As a part of performance optimization, investigation of the effect of various back-washing techniques on overall filtration cycle is of great significance. The objective of the research explained in this paper is to compare few recently developed backwashing methods, like partial backwashing, filter resting and extended terminal sub-fluidized wash with the conventional method of backwashing. The comparison is based on the parameters, like water requirement for backwashing, the effect on ripening period and succeeding length of filter run. This study was carried out in association with Ichalkaranji Municipal Council by installing a pilot scale model at Ichalkaranji Municipal water treatment plant having a total capacity of 108 MLD (millions of litre per day). As it is very difficult to judge one particular method out of these four as every method has certain advantages and certain limitations, one common performance indicator is derived based on various factors of comparison. This performance indicator is quite easy to apply, flexible enough to modify as per need and age of water treatment plant.

KEYWORDS

Partial backwashing, Filter resting, Extended terminal sub-fluidized wash, Ripening period, Filter run length, Performance indicator

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Potential Of Biochar Derived From Crop Residues In Soil Remediation And Controlling Air Pollution Due To Stubble Burning

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The burning of agricultural waste (stubble) in open fields (locally known as Parali) by the Indian farmers in Punjab, Haryana, Uttar Pradesh, Rajasthan, Madhya Pradesh and other nearby states during last four-five years has drawn attention of the Central and State Governments, Hon'ble Supreme Court of India and the National Green Tribunal (NGT) alongwith the common public because it is alleged to be one of the reasons for creating exceptionally high air pollution and smog in Delhi during months of September to November every year. One of the novel and feasible solutions to this problem may be converting the agro-waste into a useful product, biochar, which can be applied back to the fields for remediation of contaminated soil, improvement in soil properties as well as for reducing the entry of harmful gases into the environment. A novel method of producing biochar has been developed by the authors wherein the crop residues can be converted into biochar by an individual farmer on field itself without much investment and technical skills. Many researchers have studied the factors involved in the production and use of biochar for soil amendment; but in India, not much work has been carried out yet, as it is relatively a new concept in terms of using crop residues for biochar production. Therefore, in this paper, it has been tried to summarize the research done so far alongwith a critical assessment of various studies and their findings to help decide upon the future course of research and action, especially in Indian context where agricultural waste is produced in large quantities and its disposal creates environmental air pollution when burnt in open fields. There is a need to create awareness among the farmers about this novel approach of biochar production and application.

KEYWORDS

Biochar, Crop residues, Soil properties, Greenhouse gas, Climate change

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Measurement Of Nitrogen Dioxide Emissions From The Industrial City Of Sahab In Jordan

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The average emission rates of nitrogen dioxide (NO₂) have been measured in the city of Sahab, southeast of Amman, Jordan. Sahab is a famous city for its industrial estate. Data obtained from the Ministry of Environment for 6 years for pollutant emissions and meteorological conditions (February 2010-December 2016). The results from the monitoring showed that the average annual NO₂ concentration was 19.8066 ppb, compared to the monthly average of 17.34 ppb. The most recent monthly average was 1.358 ppb in July 2015 also the highest average of all months in all years in April, it was 23.638 ppb. The findings of the statistical review indicate that the annual NO₂ average does not surpass the Jordanian ambient air quality limits allowed by the guidelines. The forecasted variability in the season shows that the level of NO₂ was typically higher in winter than in summer, due to low temperatures, high average moisture and increasing NO₂ sources which increase NO₂ emissions. In order to understand the high NO₂ concentrations at the residential site, environmental data have been analyzed (mainly wind and wind directions). The research has shown that the winds hit calm and south. This ensures that such winds do not disperse or minimize pollution but increase the concentration of pollutants. More than 77% of the wind is blowing at 0-5 m/s level. This wind blow contributes to the accumulation of its concentrations. There has been a negative association ($r = -0.5217$, $p < 0.001$) between NO₂ concentrations and wind speed. This situation shows that air pollution dilutes with dispersion when the wind speed is high. The negatively correlated between NO₂ and wind direction ($r = -0.6932$, $p < 0.001$) is also found. It may be clarified that the most commonly occurring wind path at the measurement site increases air pollution mitigation.

KEYWORDS

Nitrogen dioxide, Air pollution, Statistical analysis, Sahab industrial estate, Meteorological parameter

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Biodegradation Of White Chicken Feather Waste Pollutants By Bacteria

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Biodegradation of white chicken feather by isolated keratinolytic bacteria, like NKR1-NKR9 was most effective. The bacterial strain *Bacillus licheniformis* DAS-2-NKR6 was more effective for degradation of chicken feathers. The other identified bacterial strain NKR1 grew very well till 55°C but its keratinolytic activity was restricted to 46°C. NKR6 bacterial strain was also grew well but it produces peptidase only between 20-45°C. The keratinase enzyme was purified by ammonium sulphate precipitation. The highest purification factor of our strain was 3.7-fold for strain NKR-6 and the final yield was 17.6%. Specific activity of enzyme had 34.02 U/mg where feather keratin act as substrate. SDS-PAGE was used for the determination of molecular weight of purified enzyme. Purified enzyme showed single band with molecular wt. of 43 kDa whereas crude enzyme showed multiple bands, compared with the protein marker range 14-80 kDa.

KEYWORDS

Bacillus licheniformis DAS-2-NKR6, SDS-PAGE, Chicken feathers, Biodegradation

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Intervention Of Artificial Intelligence In Agriculture: Role, Application And Status

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Agriculture is nearly a \$3 trillion industry and the issues, like increasing population trend, climate change, area reduction in cultivation, food security have propelled agriculturists for searching for innovative approaches to protect and improve crop yield in order to mitigate poverty and hunger. The interventions of artificial intelligence (AI) and its increasing applications have transformed the whole agriculture into soft computing agriculture, which has opened the prospects of yielding healthier crops, control pests, monitor soil and growing conditions, organize data for farmers, assist in the workload and improve a wide range of agriculture-related tasks in the entire food supply chain. Currently, applications of artificial intelligence are becoming policy issues as it provides an understanding of current and emerging trends in agriculture to the business leaders and now playing an imperative role in cutting the agriculture cost with guaranteed efficiency. The present article provides glimpses on the role and application of AI in agriculture with special reference to crop science.

KEYWORDS

Agriculture, Artificial intelligence, Crop, Soft computing agriculture

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In-Vivo Assessment To Behavioural, Morphological And Melanophoric Alterations In Response To Exposure To Mercuric Chloride In Freshwater Fish, *Channa punctatus* (Bloch.)

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The present research focused on the acute and chronic toxicity of mercuric chloride to freshwater fish, *Channa punctatus*, understanding the behavioural, morphological changes and variations in melanophores. The static non-renewal acute toxicity assay was conducted by exposing the fishes to four test concentrations of mercuric chloride and 96 hr LC50 value alongwith 95% confidence limits were found to be 1.38 mg/L. The physico-chemical analysis of water was done using standard methods. The behavioural and morphological abnormalities were recorded with 8 hr observation per day during the period of 96 hr for control and exposed groups. The results showed the altered behaviour and morphological changes such as opaque eyes, erratic swimming, loosening of scales, mucous secretion and coloration changes was observed in exposed group of fishes. Three sub-lethal doses on the basis of LC50 value for chronic assay were selected (0.138 mg/L, 0.276 mg/L and 0.414 mg/L). The scales were harvested from control and exposed groups for melanophores studies by using compound microscope. The duration and concentration dependent significant variations ($p \leq 0.05$) in the different forms of melanophores were observed and frequency of melanophores were calculated as mean \pm S.E. The 5 different forms named punctate (P), punctostellate (PS), stellate (S), reticulostellate (RS) and Reticulate (R) were observed and there occurs decrease in dispersal forms of melanophores (reticulate and reticulostellate) and increase in aggregated forms of melanophores (punctate, punctostellate).

KEY WORDS

Mercuric chloride, *Channa punctatus*, Behaviour, Morphology, Melanophores, Punctate, Punctostellate, Stellate, Reticulostellate, Reticulate

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A Report On The Structure And Abundance Of Zooplankton In Muthanathi Pond Virudhunagar District

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Physico-chemical parameters and plankton diversity have been carried out in Muthanathi pond for a period of 6 months from October 2016 to March 2017. The water temperature of the pond during study period ranged from 22 - 25°C. The pH of the pond ranged from 6.7-10.8 and showed alkaline condition throughout study period. The alkalinity of the pond ranged from 36-87 mg/L. The hardness was ranged from 35-46 mg/L. Dissolved oxygen of the pond was ranged from 3.8-5.8 mg/L. A total of 18 species of zooplanktons, 9 species of Rotifers, 2 species of Cladocerans, 2 species of Copepods and 5 species of Ostrocods were recorded.

KEYWORDS

Plankton diversity, Physico-chemical parameters, Temperature, Alkalinity, Rotifers, Cladocerans

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