Faculty of Applied Sciences
Sabaragamuwa University of Sri Lanka

Out of the Press

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Peer-reviewed Journal Articles

DNR

Evaluation of the effect of landfill leachate on surface and groundwater quality: a case study in tropical Sri Lanka using the evidence of stable isotopes

Ruchini Wijewardhana Sachintha Senarathne Chandramali Kumari Jayawardana Viraj Edirisinghe Hasintha Wijesekara Nalin Mannapperuma

Abstract

The disposal of solid wastes is a significant problem in urban areas in many developed and developing countries. Waterways are often subjected to pollution by effluents discharged from solid waste dumpsites. The stable isotopes and water quality data provide useful information on tracing pollutant sources and their contaminant pathways. The effect of a major solid waste dumpsite on surface and groundwater quality of the surrounding area was investigated by measuring water quality parameters and stable isotopes of deuterium (^{2}H), oxygen (^{18}O), $^{15}N\text{-}NO_3$ and $^{18}O\text{-}NO_3$ in tropical Sri Lanka. The surface water and groundwater wells close to the dumpsite indicated clear evidence of leachate contamination with enriched total dissolved solids (TDS), total suspended solids (TSS), ammonia, biochemical oxygen demand (BOD_5) and Cl^- levels. The correlation of groundwater quality parameters, i.e. EC ($-r^2 = 0.8$), TDS ($-r^2 = 0.8$), TSS ($-r^2 = 0.5$), ammonia ($-r^2 = 0.4$), phosphates (−0.6), sulphates (−0.5), Cl^- (−0.6) and isotope $\delta^2H‰$ (−0.9) with distance from the dumpsite, further confirmed the effects of dumpsite on groundwater quality. The composition of $\delta^{15}N\text{-}NO_3$ and $\delta^{18}O\text{-}NO_3$ isotopes in the groundwater indicated that the dominant source of NO_3^- to groundwater is manure septic originating from the dumpsite. The findings of the study provided clear evidence of the effect of open dumping on the water resources of the surrounding area and the need for remedial measures.

About the Journal

Environmental Monitoring and Assessment

Impact Factor – 3.307

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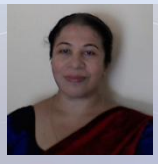

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DNR

The Anti-microbial Potential of *Lasiodiplodia Theobromae* Inhabiting the Lichen *Heterodermia* sp. Available in Sri Lanka

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Abstract

Sri Lanka is well-known for its lichen biodiversity. Lichen is a symbiotic association between a fungal partner a photosynthetic partner. Lichen inhabiting fungi may reside in lichens without involving in symbiosis. Unique secondary metabolites, especially lichen inhabiting fungi are reputed for antimicrobial, anti-inflammatory, anti-proliferative and antioxidant activity. The lichen *Heterodermia* sp. was collected from the Paraviyangala mountain of Kalupahana mountain range in Belihuloya of Sabaragamuwa province in Sri Lanka. Lichen inhabiting fungi were isolated by plating surface sterilized thallus pieces onto potato dextrose agar medium. Emerging fungal tips from the plated pieces were transferred onto fresh medium to obtain pure cultures. Among the fungi isolated, *Lasiodiplodia theobromae* was identified using colony characteristics, micromorphology and DNA barcoding. The internal transcribed spacer (ITS) region was amplified using ITS-1 and ITS-4 primers to identify the fungus. Crude extracts were obtained from the fungal isolate via solvent extraction using three different solvents: Ethyl acetate, Hexane and Dichloromethane. Then they were screened in triplicate for antimicrobial activity by agar disk diffusion assay using bacteria: *Escherichia coli* (ATCC® 25922), *Pseudomonas aeruginosa* (ATCC® 27853) and *Staphylococcus aureus* (ATCC® 25923) and a clinical isolate of the fungus *Candida albicans*. Ethyl acetate and dichloromethane crude extracts showed antimicrobial activity against gram positive and negatives as well as Candida. The Ethyl acetate fraction gave the best results. Therefore, *Lasiodiplodia theobromae* has the potential to be used as a source of novel antibacterial and antifungal compounds.

About the Journal

J. Innovation Sciences and Sustainable Technologies

https://doie.org/10.0725/JISST.2022653218

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DNR

Nanoplastic occurrence, transformation and toxicity: a review

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Abstract

Nanoplastics are emerging contaminants of concern for living organisms and ecosystems, yet nanoplastics are difficult to extract and analyse. Once released into the environment, the fate and behavior of nanoplastics are controlled by physical, chemical, and biological factors. Here, we review nanoplastics weathering, aggregation, biofouling, and bioavailability. Nanoplastics adsorb and transport metals and organic contaminants. Ingestion of nanoplastics by aquatic organims such as microbes, algae, invertebrates, and fish, induces toxicological effects on organism growth, behavior, and reproduction.

About the Journal

Environmental Chemistry Letters

Impact Factor – 13.615

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Socio-economic determinants of Chronic Kidney Diseases of uncertain etiology (CKDu) in the Uva Province, Sri Lanka: a cross-sectional study

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Abstract

CKDu is one of the most serious health problems in Sri Lanka. The country's Uva Province (UP) faces an increasing number of CKDu patients. Therefore, this study develops a statistical model to identify the socio-economic determinants of CKDu in UP, Sri Lanka. This cross-sectional study draws on a questionnaire survey conducted with 229 farmers, of which 24% were CKDu patients, to ascertain the socio-economic predictors that contribute to CKDu. The relationship between socio-economic risk factors and CKDu was delineated using a logistic regression model and by analyzing odds ratios. The highest risk of CKDu was observed among participants who consume agrochemical-applied foods (OR 7.9657, 95% CI = 2.2205, 28.5755) and potentially contaminated drinking water (OR 3.3693, 95% CI = 1.5540, 7.3053). Furthermore, age (OR 1.1097 95% CI = 1.0542, 1.1680), gender (OR 4.4980, 95% CI = 1.1406, 17.7382), and education level (OR 21.1018, 95% CI = 1.7753, 250.8250) were also identified as significant risk factors.

About the Journal

Journal of Environmental Studies and Sciences

Impact Factor – 1.189

https://doi.org/10.1007/s13412-022-00780-y

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Book Chapters

DNR

Phytoremediation of soils contaminated with poly- and per-fluoroalkyl substances (PFAS)

Nanthi Bolan, M.B. Kirkham, Vishma Perera, Sonia Mayakaduwage, Anusha Ekanayake, Anushka Upamali, Rajapaksha, Hasintha Wijesekara, Prashant Srivastava, Meththika Vithanage

Abstract

Poly- and per-fluoroalkyl substances (PFAS) are synthetic chemicals and reach the terrestrial and aquatic environments through anthropogenic activities. Aqueous, film-forming foam used in firefighting and disposal of solid (e.g., dewatered biosolids) and liquid (e.g., sewage effluent) wastes are major sources of PFAS in soil. Because of the strong chemical and thermal stabilities of PFAS compounds, remediation of PFAS-contaminated substrates, including biowastes, soil, and groundwater, is challenging. In this chapter, remediation of PFAS-contaminated soils, through manipulation of the bioavailability of PFAS, is presented, and special emphasis is given to phytoremediation.

About the Book

Current Developments in Biotechnology and Bioengineering.

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https://doi.org/10.1016/B978-0-323-99907-6.00012-8

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Conference Proceedings

DNR

First lichenicolous study reveals the hidden fungal diversity in Sri Lanka

Hasanka Dangalla, R.G.U. Jayalal and Nalin N. Wijayawardene

Abstract

Lichenicolous fungi are the parasitic fungi that only live on the lichen thallus, and they cause some adverse effects on the lichen growth rate. In the current study, lichenicolous fungi in Belihuloya, Sri Lanka were isolated and identified as the first study of lichenicolous fungi in Sri Lanka. Wangedigala and Paraviyangala were the sample collecting areas that have with similar favorable climatic conditions for lichen growth (i.e. low temperature, high humidity). Both forest areas were mostly covered with *Pinus vegetation* and rocks. Almost all the lichen samples were collected from the bark of the *Pinus* trees and from the rock surfaces. Oddly color spots, discolorations of the thallus and gall-like structures were helped to identify lichenicolous fungi on the lichens in the field.

Potato Dextrose Agar (PDA) was used as the culture medium, and fruiting bodies and fungal hyphae were inoculated using the direct plate method . Colony characters were used to differentiate the lichenicolous taxa. Based on colony features, 15 distinct lichenicolous species were identified from the collected lichen samples.

The current study reveals that *Parmotrema* sp. is the most frequent host lichen species that lichenicolous fungi occur. Six of the 16 lichen samples were *Parmotrema* species. Furthermore, numerous lichenicolous fungi were found from the host lichen species, including *Pertusaria* sp., *Hypotrachyna* sp., *Caloplaca* sp., and crustose lichens. All the findings indicate that the Belihuloya area is successfully inhabited by lichenicolous fungi with remarkable diversity.

About the Conference

Asian Mycological Congress 2021

3 – 5 August 2022

Thailand

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The mental stress crisis and coping strategies among the first-year female undergraduates at the selected departments of Faculty of Applied Sciences in Sabaragamuwa University of Sri Lanka during the outbreak of Covid-19

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Abstract

With the outbreak of Covid-19, university students had a heightened risk of experiencing mental stress. The study aims to elaborate female students views and their coping strategies with the mental stress status prior, during the outbreak of Covid-19 among the selected first year female undergraduates in Faculty of Applied Sciences, Sabaragamuwa University. The simple random sampling method was utilized and involved 30 number of first year female undergraduates of age between 20- 23 years. A web-based survey was carried out using the google forms, included Depression, Anxiety and Stress Scale (DASS-21). DASS-21 scoring standard questions have a four point scale system starting from 0 to 3. The level of depression, anxiety, stress, was categorized as normal, mild, moderate, severe, and extremely severe based on the mean scores. Students' stressors and coping strategies were assessed with open- ended questions. The data were analysed by Microsoft Excel 2013. Among the 30 participants, a total of 100% (n=30) of the undergraduates reported that they were more stressed during the outbreak of Covid-19. Regarding DASS21, 3 (10%), 18 (60%), 4 (13%), 3 (10%), 2 (6%) displayed signs subsequently, normal, mild, moderate, severe, and extremely severe stress conditions. For DASS21, mean scores were calculated for depression, anxiety and stress and had mean scores of 8.1, 5.06 and 9.8 points respectively. The majority of students (76.7%) mentioned "academic pressure" as the primary reason. Among the respondents, only 11 (36.7%) were able to cope with the stress personally. High proportion of respondents indicated experiencing mild to severe levels of stress which alarms to planning prevention programs that are more tailored to the needs of the students and anticipating their needs. It may be possible to increase the number of universities involved in this study and to compare and contrast both gender differences under specific circumstances.

About the Conference

1st International Research Conference on Healthy Delights - 24th August 2022 University of Jaffna

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Research Grants

Name of the Recipient	Prof. R.G.U Jayalal
Department	Natural Resources
Position	Professor
Email	jayalal@appsc.sab.ac.lk
Name of the grant	International Association for Plant Taxonomy IAPT – Central Office PlantScience and Biodiversity Centre, SlovakAcademyof Sciences Dúbravskácesta 9, 845 23 Bratislava, SLOVAKIA TEL.: +421-2- 5942-6151; FAX: -6150 email: office@iapt-taxon.org www.iaptglobal.org
Grant winning project title	Higher plants and cryptogrammic species collection at the University premises of Sabaragamuwa University of Sri Lanka
Grant amount	2000 USD