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Geochemistry of Groundwater in the Semi-Arid Crystalline Terrain of Sri Lanka and Its Health Implications among Agricultural Communities

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Abstract

Chronic kidney disease with uncertain etiology (CKDu) is an emerging health problem in Sri Lanka, particularly among the dry-zone farming communities that use groundwater for drinking. We investigated the quality of groundwater in an area where both high- and low-prevalence clusters of CKDu have been recorded. Eighty-four groundwater and five surface water samples, covering the selected region, were collected and analyzed for both major anions and cations. The groundwater in the region is mainly of the Ca-Mg-HCO_3 type, probably due to the long residence time in fractured hard rock aquifers in this region. Irrespective of the CKDu prevalence, over 50% of samples exceeded the recommended limits for EC/TDS, alkalinity, hardness, and Mg^{2+} content in groundwater. Water hardness in CKDu clusters was dominated by Mg^{2+}. High fluoride content up to 4.0 mg/L was also found in most groundwater samples from the region. The water quality index (WQI) values indicated that 42% of the groundwater samples in regions with no or low CKDu prevalence and 49% of the samples in regions with high prevalence were poor in quality. The spatial distribution of WQI and fluoride concentration overlapped, indicating the direct influence of fluoride on the groundwater quality in the study region. In addition, regions with higher WQI values overlapped with the CKDu hotspots, indicating the direct impact of groundwater quality on the disease prevalence in the studied river basin. The WQI can be used to effectively demarcate areas with possible groundwater-related health effects in the dry-zone regions of Sri Lanka.

About the Journal

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Conference Proceedings

DNR

Current status of lichens in Sri Lanka

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Abstract

The study of lichens has increased rapidly in many countries of the world. Similarly, in Sri Lanka, lichens and their related studies and researchers have received the attention of many people. Among them, the classification of lichens, the identification of new lichens, and bioactivity testing of secondary metabolites produced by lichenicolous, endo-lichenic, and lichenicolous fungi, are widely performed. As a tropical country, Sri Lanka harbor many lichens in different environments and on many substrates including barks, rocks, soils, and leaves. According to a recent report, 876 lichen species in 233 genera and 60 families have been reported from Sri Lanka. Among the reported species, more than 150 species are endemic to Sri Lanka and are represented by the families Parmeliaceae and Graphidaceae. Those figures are based on data obtained from studies that cover less than 10 % of Sri Lanka's land area. Many Sri Lankan scientists conclude that there are probably about 5000 lichen species in Sri Lanka as the unexplored area of the country is very large. Extinction of lichens due to habitat loss is the main threat in many countries including Sri Lanka. Over-harvesting, deforestation, forest fragmentation, anthropogenic activities, urbanization, and air pollution are the main causes of the loss of lichen habitats. Therefore, immediate actions including forest management planning, the mitigation of forest destruction, and the introduction of new environmental laws, policies, and regulations need to be taken to conserve lichen flora in Sri Lanka.

About the Conference

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Lichenicolous fungi in Sri Lanka and their bioactivities

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Abstract

Lichenicolous fungi are the taxa that only live on the lichen thallus and 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 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 the rock surfaces. Oddly color spots, discolorations of the thallus, and gall-like structures 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. All the findings indicate that the Belihuloya area is successfully inhabited by lichenicolous fungi with remarkable diversity. Being able to thrive in lichens successfully, such fungi might be possessing special adaptations including chemical compounds in order to overcome the resistance conferred by the fungal partner of the lichen. Hence there is a possibility that such fungi can harbour chemical leads that have valuable pharmacological properties. anti-fungal and antioxidant activities will be tested for lichenicolous fungi. The Poisoned Food Technique will be used to evaluate the antifungal effect and Antioxidant activity will be determined by the 2,2-diphenyl-1-picrylhydrazyl radical (DPPH) scavenging method.

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Screening and identification of the Cellulolytic, Hemicellulolytic & Lignocellulolytic enzymes of freshwater fungi in the Anuradhapura District, Sri Lanka

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Abstract

Sri Lanka is a biodiversity-rich country but fungal diversity is not properly studied and documented. Freshwater fungi of Sri Lanka have barely been studied although the country is rich with natural and man-made reservoirs. Anuradhapura district is rich in various lotic and lentic freshwater habitats with a dry zone environment. Freshwater fungi play a dominant role in leaf litter and other organic material decomposition in freshwater ecosystems. In addition, they directly contribute to maintaining nutrient cycles by producing extracellular enzymes for plant material decomposition. Cellulolytic, hemicellulolytic & lignocellulolytic enzymes are important extracellular enzymes for plant material decomposition which are produced by freshwater fungi. The main objective of the research was to screen and identification of the cellulolytic, hemicellulolytic & lignocellulolytic enzymes of freshwater fungi in the Anuradhapura district. Thus, Submerged aquatic substrates (such as dead leaves and dead woody samples) were randomly collected from lotic and lentic freshwater habitats in the Anuradhapura district. Single spore isolation was performed using Water Agar (WA) and Potato Dextrose Agar (PDA) as culture synthetic media to isolate fungal freshwater strains/species. The 0.5 % microcrystalline cellulose and 0.005 % nigrosin are liable chemicals for screening and identification of the cellulolytic enzyme, 0.5% of xylan for the hemicellulolytic enzyme, and 0.1 M 1-naphthol, 0.5 % pyrogallol and 0.5 % hydrogen peroxide also act as liable chemicals for lignocellulolytic enzymes when screening and identification of the extracellular enzymes of freshwater fungi. These identifications can be used as a mycoremediation approach for overcoming the environmental issues in polluted freshwater ecosystems in the future.

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