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Assessing groundwater quality using the Water Quality Index (WQI) and GIS in the Uva Province, Sri Lanka

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ABSTRACT

The prime objective of this study is to develop a water quality index (WQI) to identify the relationship between the drinking water quality and the prevalence of Chronic Kidney Disease of Uncertain Etiology (CKDu) in the Uva Province (UP). For this, all CKDu patients in the province were recorded. 251 groundwater samples were collected and analyzed for their major cations and anions. Following this procedure, the spatial distribution maps for CKDu patients, water quality parameters and WQI were generated. The results revealed that, 20.3% of groundwater samples are categorized under "excellent" in terms of the drinking water quality, 21.2% of the samples are categorized under "good", 20.3% of the samples are categorized under "poor", 9.9% of the samples are categorized under "very poor", and 28.3% of the samples are categorized under "unsuitable" in terms of the WQI. According to the results, the most significant correlation was recorded between fluoride content in the samples and WQI (0.96). Statistical analysis showed that the WQI has a strong positive correlation (0.68) with the spatial distribution of CKDu patients in the UP inferring that groundwater quality has a significant effect on the prevalence of CKDu in the UP. Moreover, these maps can be effectively used by decision makers for groundwater quality management activities in the UP, Sri Lanka.

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Necessity of a National Fungarium and a Culture Collection for Fungi in Sri Lanka

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Abstract

Sri Lanka is rich in biological diversity, but its fungal diversity is not adequately studied and documented. Recent fungal diversity estimations have predicted that the tropical regions would harbour a large number of novel fungal species. Fungi are ubiquitous, hence it is important to carry out proper investigations to discover novel taxa in different habitats and ecosystems. These taxa represent different life modes i.e. pathogens (of plants, animals and humans), saprobes, endophytes, symbionts (lichens, mycorrhizae), and lichenicolous. Current mycology is mainly based on polyphasic approaches (morphological, DNA based and chemical analyses) to define the species (consolidated species concept). DNA based phylogenetic analyses are widely used in higher level classification. These DNA are mainly extracted from cultures. Depositing a specimen that the fungus is present at a reputed Fungarium and depositing a culture resulted from the specimen at a reputed culture collection is important. The "International Code of Taxonomy of Nomenclature for algae, fungi and plants" stated that it is important to deposit the holotype at a reputed fungarium, while depositing the ex-type culture which is derived from the holotype at a reputed culture collection is also essential. Besides species identification and classification, these specimens and cultures are important in future studies and in genetic resource conservation. In Sri Lanka, currently a national fungarium and a culture collection for fungi do not exist. However, several institutional collections and personal collections are available. In this conceptual paper, we propose to establish a central, national fungarium to deposit holotypes and a culture collection to deposit ex-type cultures while maintaining several regional or mirror collections to replicate the specimens as isotypes and paratypes, and cultures as ex-isotypes and ex-paratypes.

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Numerical Study of Triplet Dynamics in Organic Semiconductors Aimed for the Active Utilization of Triplets by TADF under Continuous-Wave Lasing

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Abstract

The limitation of lasing duration less than nanosecond order has been a major problem for realizing organic solid-state continues-wave (CW) lasers and organic semiconductor laser diodes. Triplets accumulation under CW excitation has been well recognized as a critical inhibiting factor. To overcome this issue, the utilization of thermally activated delayed fluorescence (TADF) emitters is a promising mechanism because of efficient reverse intersystem crossing. Herein, we model the triplet accumulation processes under lasing and propose the active utilization of TADF for lasing based on our simulation analysis. We used the rate constants experimentally determined from the optical properties of a boron difluoride curcuminoid fluorophore showing both TADF and lasing. We demonstrate that the intersystem crossing efficiency is gradually increased after the convergence of relaxation oscillation, i.e., terminating laser oscillation. In addition, we found that when the reverse intersystem crossing rate is close to the intersystem crossing rate, CW lasing becomes dominant.

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Monograph

Simplified extraction method of metribuzin from minimal salt medium broth and quantification using GC – MS

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Abstract

Gas chromatography mass spectrometry (GC-MS) is one of the great techniques used to detect and quantify the pesticide residues in various matrices in the world. However, the method used in this technique can be vary from one pesticide to another since the same method would not detect all the pesticides in the world. As well as, the suitable method may depend on various factors such as pesticide concentration, matrix used to detect pesticides etc. Hence development of suitable methods for the extraction and detection of different pesticides from different matrices is significant.

When considering pesticide contaminations and reducing its harmful impacts, bioremediation has been identified as one of the successful way of degrading residual pesticides in pesticide contaminated sites. Worldwide scientists have been researching for identifying naturally occurring microorganisms such as bacteria in order to use in bioremediation of pesticide contaminated sites. In this research methods, minimal salt medium is commonly used in identifying pesticide degrading capacity of various bacteria by growing them in that medium supplemented with target pesticides.

In this monograph it is presented a finalized method developed after going through a number of trial and error experiments for the extraction of metribuzin (one of the commonly used herbicide in agriculture) from a small volume such as 01 ml of minimal salt medium broth (a liquid matrix) and quantification of the relatively larger amounts (ppm levels) of metribuzin dissolved in the considered medium using gas chromatography mass spectrometry equipped with Agilent 8890 GC system and Agilent 5977B GC/MSD.

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Conference Proceedings

Work From Home After Covid-19: Machine Learning-Based Approach to Predict Employee's Choice

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ABSTRACT

Prior to the Covid-19 pandemic, Work from Home (WFH) was becoming an increasingly common practice, and during the pandemic, millions of employees across the globe were forced to shift into full-time WFH. It is expected that organizations will continue the WFH in a hybrid mode along with Work From Office (WFO) even after the pandemic. This study aims to predict the choice of employees on continuing WFH after the pandemic. The data set was collected using an online questionnaire shared among a sample of employees engaged in WFH during the pandemic. Naïve Bayes Artificial Neural Network (ANN), Random Forest, and Ensemble Learning-based approaches were used to generate the prediction models. Ensemble Learning-based approach was the best classifier compared to the other three classifiers and it obtained a 91.6% accuracy value. Naïve Bayes showed the lowest performance.

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