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Accumulation of heavy metals in tea leaves and soils: a case of Sri Lankan tea plantation

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ABSTRACT

The application of herbicides is one of the most convenient weed management techniques available in Sri Lankan tea plantations. Thus the prime aim of this study was to determine the effects of herbicides on fresh tea leaves, processed (black) tea leaves, and tea soils. The microwave digestion system and atomic absorption spectrometer (AAS) were mainly used to determine the levels of metal contaminations of fresh tea leaves/black tea and tea soils. The results revealed that Zn, Fe and Pb levels of soils of herbicides applied tea plantation are significantly higher ($p < 0.05$) than the soils of herbicides free plots. Further, the results showed that Pb levels of green leaves and black tea are slightly higher ($p < 0.05$) in herbicide-treated plots. Overall, the present study gives insights into the heavy metal contamination levels in soils, green leaves, and black tea under chemical weed management systems in Sri Lanka.

About the Journal

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Analysis of the diversity and distributional patterns of coleopteran families on a global scale

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ABSTRACT

Invertebrates make up the majority of all living species on earth. Nevertheless, our understanding of the global distribution of terrestrial biodiversity and regional patterns therein has thus far been almost entirely based on vertebrate and vascular plant patterns. Here we try to provide some information on the global biogeography of the largest invertebrate order, the beetles (Coleoptera). We compile and analyse a database of beetle distributions, containing presence-absence data for 177 coleopteran families across 827 ecoregions. We map family richness and weighted endemism and find the highest values in the Neotropics and Southeast Asia, but also in the temperate northern hemisphere. Important centres of beetle family endemism include the western and southern parts of North America, Central America, temperate South America, Europe, South, Southeast and East Asia, and eastern Australia. A series of UPGMA cluster analyses were used to produce two global regionalisation maps. As analyses on the complete dataset failed to produce contiguous clusters, two sub-datasets were considered. The first one excluded widespread families and family-poor ecoregions, and the second was restricted to endemic-rich ecoregions. The clusters resulting from the first analysis are partly similar to vertebrate- and plant-based regionalisation schemes, with easily discernible and extensive Holarctic and Holotropical regions, but also include numerous smaller regions, mostly in the temperate parts of the southern Hemisphere (Andean, Patagonian, Matorral, New Guinean, New Caledonian, southern African), with Australia split between a tropical and a temperate/subtropical part. New Zealand is not analysed in this reduced dataset, but clusters with New Caledonia in the endemic-rich analysis, where further interesting subdivisions emerge (mainly in East Asia and western North America). We discuss these patterns in the light of coleopteran dispersal and the habitat requirements predominant across the coleopteran phylogeny, while considering the age of beetle families.

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Using numerical analysis of ordinary differential equation systems to predict the chemical concentration after plasma irradiation

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ABSTRACT

In this study, a zero-dimensional numerical simulation of the atmospheric pressure plasma (APP) interface with a liquid solution was performed. By assuming that the solution reaction is dependent on the injection of radicals and electrons, we were able to obtain a single short APP discharge with the liquid solution. This study can predict excitation temperature, electron temperature, and population densities of species and result in optimum conditions for a chemical reaction for the synthesis of nanoparticles or other applications of the reaction between APP and liquid surface. This work aims to explain the effect of pH values on the synthesis of gold nanoparticles compared with experimental results. We found that the effect of pH value is expected to impact the generation of gold nanoparticles. Therefore, a high pH value is suitable for generating gold atoms for nano-synthesis. The fundamental plasma properties, such as population density, electron temperature, excitation temperature, and gas temperature, and chemical reaction process were studied. The simulation results were consistent with the experimental observations.

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