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Comparison of nutritional composition, bioactivities, and FTIR- ATR microstructural properties of commercially grown four mushroom species in Sri Lanka; *Agaricus bisporus, Pleurotus ostreatus, Calocybe sp.* (MK-white*), Ganoderma lucidum*

Malmi Apsara Wickramasinghe, Harshani Nadeeshani, Suriya Mudiyanselage Sewwandi, Isuri Rathnayake, Thilini Chathurangi Kananke and Ruvini Liyanage

Abstract

Mushrooms have been consumed as delicacies since ancient times; however, little knowledge is available on the nutritional and bioactive properties of commercially grown mushroom species in Sri Lanka; button (*Agaricus bisporus*), oyster (*Pleurotus ostreatus*), Makandura white (*Calocybe sp.*), and Reishi (*Ganoderma lucidum*). Samples from four mushroom species were analysed for proximate composition, mineral and fatty acid content, and antioxidant, antidiabetic, and microstructural properties. Carbohydrate, protein, fat, ash, and dietary fibre content in mushroom species ranged from 64.83–79.97%, 10.53–23.29%, 0.57–4.37%, 2.80–11.00%, and 33.04 to 75.33%, respectively. The highest ($P \leq 0.05$) protein and ash content were observed in *A. bisporus,* and *G. lucidum* had the highest ($P \leq 0.05$) fat and dietary fibre content. When considering the micronutrients, *G. lucidum* comprised higher ($P \leq 0.05$) Ca, Mg, Mn, and Cu, while *A. bisporus* had higher ($P \leq 0.05$) Fe and Zn contents than other species. Essential omega-6 fatty acid, linoleic (18:2n-6) content was in the range of 37- 81% in studied mushroom samples. Results obtained from FTIR (Fourier transform infrared spectroscopy) in conjunction with ATR (Attenuated total reflectance) revealed the presence of functional groups associated with fat (1740 cm^{-1}), protein (1560 cm^{-1}), polysaccharides (1500–750 cm^{-1}) and moisture (3300 cm^{-1}) in mushroom samples. According to the results, *P. ostreatus* showed the highest ($P \leq 0.05$) polysaccharide content, while *G. lucidum* showed the lowest ($P \leq 0.05$). The highest ($P \leq 0.05$) total phenolic content (TPC) (3.95 ± 0.05 mg GAE/g DW) and total flavonoid content (TFC) (2.17 ± 0.06 mg CE/g DW) were observed in *P. ostreatus*. Antioxidant activity measured by DPPH, ABTS, and FRAP methods was higher ($P \leq 0.05$) in *P. ostreatus* and *A. bisporus* compared to the other two species. Among all the studied mushroom species, *G. lucidum* showed the highest ($P \leq 0.05$) α-amylase (IC_{50} = 77.51 ± 6.80 µg/mL) and α-glucosidase (IC_{50} = 0.4113 ± 0.08 µg/mL) inhibition activities. This study reveals the potential of using *A. bisporus, G. lucidum,* and *P. ostreatus* for nutritional, functional, and therapeutic uses.

About the Journal

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Our Scholar

Dr. TC Kananke

Senior Lecturer

thilini@appsc.sab.ac.lk

DNR

Tungsten contamination, behavior and remediation in complex environmental settings

Shiv Bolan, Hasintha Wijesekara, Achali Ireshika, Tao Zhang, Mingjun Pu, Gianniantonio Petruzzelli, Francesca Pedron, Deyi Hou, Liuwei Wang, Sarah Zhou, Hoachen Zhao, Kadambot H.M. Siddique, Hailong Wang, Jörg Rinklebej, M.B. Kirkham, Nanthi Bolan

Abstract

Tungsten (W) is a rare element and present in the earth's crust mainly as iron, aluminium, and calcium minerals including wolframite and scheelite. This review aims to offer an overview on the current knowledge on W pollution in complex environmental settlings, including terrestrial and aquatic ecosystems, linking to its natural and anthropogenic sources, behavior in soil and water, environmental and human health hazards, and remediation strategies. Tungsten is used in many alloys mainly as wafers, which have wide industrial applications, such as incandescent light bulb filaments, X-ray tubes, arc welding electrodes, radiation shielding, and industrial catalysts. The rigidity and high density of W enable it to be suitable for defence applications replacing lead. In soil, W metal is oxidised to the tungstate anion and occurs in oxidation states from −2 to +6, with the most prevalent oxidation state of +6. However, recently, people have been alerted to the risk posed by W alloys and its particulates, which can cause cancer and have other detrimental health effects in animals and humans. The population is subject to W pollution in the workplace by breathing, ingestion, and dermal contact. Remediation of W-polluted soil and aquatic environments can be accomplished via stabilization or solubilization. Stabilization of W in soil and groundwater using immobilizing agents inhibits the bioavailability of W, thereby preventing the contaminant from reaching the food chain, while solubilization of W in soil involving mobilizing materials accelerates the elimination of W via soil washing and root absorption. Future research opportunities covering risk-based remediation of W pollution in these complex settings are presented.

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Our Scholar

Dr. SSRMDHR Wijesekara

Senior Lecturer

wijesekara@appsc.sab.ac.lk

Book Chapters

DNR

Origin, Distribution, Fate, and Remediation of Microplastics in Biowastes and Biowaste-Amended Soil

Prashant Srivastava, Nanthi Bolan, Veronica Casagrande, Ravindu Perera, and Hasintha Wijesekara

Abstract

Microplastics are an emerging class of contaminants that are ubiquitous in the environment and have been detected in terrestrial, marine, and freshwater ecosystems, and even at remote locations. These are becoming a huge challenge due to their adverse impact on human health and the environment, particularly the marine environment. Biowastes, such as farmyard manure, composts, crop residues, and biosolids are land-applied due to the abundance of carbon and nutrients. However, due to the contamination of microplastics, the land application of biowastes inadvertently adds particulate plastic to agricultural soil, making them available for uptake by soil biota and eventually, the food chain. Due to their fine particle size and large surface area, microplastics (and nanoplastics) adsorb other contaminants on their surface and act as a vector; therefore, uptake of microplastics by soil biota, followed by humans and animals can lead to adverse effects due not only to microplastics but also to the contaminants transported by them. Unfortunately, due to the inherent properties of plastics and polymers, it is difficult to remediate microplastics in the environment, particularly in biowastes and biowaste-amended soil. There are limited physical, chemical, and biological remediation methods available to remove, treat, or degrade microplastics, which are described in this chapter.

About the Book

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Our Scholar

Dr. SSRMDHR Wijesekara

Senior Lecturer

wijesekara@appsc.sab.ac.lk

Monographs

DNR

Checklist, typification details, and nomenclature status of Basidiomycota, originally described from Sri Lanka

Samantha C. Karunarathna, A.K Hasith Priyashantha, Saowaluck Tibpromma, Mahesh C. A. Galappaththi, Bhagya M. Premarathne, Nalin N. Wijayawardene, Madhara K. Wimalasena, R.G. Udeni Jayala, Kawmini D. Wickramanayake, Hasanka Dangalla, W. Hashini Jayathunga, Rashika S. Brahmanage, Gothamie Weerakoon, Kahandawa G.S.U. Ariyawansa, Neelamanie Yapa, Chandrika M. Nanayakkara, Surani Ediriweera, Xin-Lei Fan, Paul M. Kirk, Gui-Qing Zhang, Aseni Ediriweera, D. Jayarama Bhat, Turki M. Dawoud, K. L. Wasantha Kumara, Chun Ying Deng, Dong-Qin Dai, D. Siril Wijesundara & Sumedha Madawala

Abstract

Sri Lanka is considered a mega-biodiversity hotspot, with a rich collection of flora and fauna. Basidiomycota is the second largest and most diverse phylum of fungi, comprising over 31,000 species. The present paper is intended to bring together all reported species with their typification details and updated/current nomenclature status of basidiomycetes in Sri Lanka. The checklist consists of 725 species belonging to a total of 138 genera. The genus *Agaricus* is represented by the highest number of species (169), followed by *Marasmius* (62), *Polyporus* (53), *Uredo* (49), *Corticium* (27), *Hygrophorus* (20), *Thelephora* (15), *Lentinus* (15), *Hydnum* (12), *Hymenochaete* (11), *Poria* (11), *Clavaria* (10), and *Puccinia* (10). All other genera constitute less than 10 species, whereas 72 of the other genera contain one species each.

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Our Scholar

Prof. RGU Jayalal

Professor

jayalal@appsc.sab.ac.lk