New and Future Developments in Microbial Biotechnology and Bioengineering

Recent Advances in Application of Fungi and Fungal Metabolites: Current Aspects

Edited by
Joginder Singh
Praveen Gehlot

ELSEVIER

NEW AND FUTURE DEVELOPMENTS IN MICROBIAL BIOTECHNOLOGY AND BIOENGINEERING

Recent Advances in Application of Fungi and Fungal Metabolites: Current Aspects

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About the book

Description

New and Future Developments in Microbial Biotechnology and Bioengineering presents an account of recent developments and applied aspects of fungi and its metabolites for human welfare. The fungi and its metabolites are employed in diverse fields of agri-food, biochemistry, chemical engineering, diagnostics, pharmaceuticals and medical device development. The book contains chapters by the eminent researchers working with fungi and fungal metabolites who explain their importance and potential in manifold prospects. The book includes a description of various fungal metabolites and their chemistry and biotechnology.

Key Features

- Highlights the latest developments surrounding the utilization of fungi and fungal metabolites
- Overviews applied aspects of fungi and their metabolites for human welfare
- Details the usage of fungi and their metabolites in diverse fields
- Identifies the importance and potential of fungi and fungal metabolites in manifold prospects
- Illustrates recent trends in fungal metabolite research using elaborate, expressive tables and figures with concise information

Details

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Chapter 17 - Chemical creativity of *Termitomyces* mushrooms

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Abstract

Mushrooms are known to have great applications in the food and medicinal industries, being endowed with biologically, nutritionally, and medicinally important compounds, which is an indication of their chemical creativity. These compounds may even impart flavors, aromas, nutritive value, culinary value, and nutraceutical properties. The Termitomyces genus is well known as an edible mushroom on the Asian and African continents. Recently, the Japanese and Chinese have explored novel neuritogenic compounds from these species and demonstrated its uniqueness among other medicinally useful species. *Termitomyces* mushrooms, the mutualistic symbiont of mound-building termites, are known to contain β-glucans, cerebrosides, alkaloids, and phenolic compounds as medicinally beneficial compounds. There are several compounds known to show antioxidant properties by acting as free radical inhibitors and oxygen scavengers, and few that act as immune modulators. In this chapter, we attempt to review the scientific information available in the chemical, biological, and scientific databases to glean the present status and prospects of *Termitomyces* for their biomedical potential based on chemical creativity.

CHAPTER

17

Chemical creativity of *Termitomyces* mushrooms

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17.1 Bipotentialities of *Termitomyces* Heim

All the known species in the genus *Termitomyces* are edible and form an important resource in the ethnomycophagic traditions in Afro-Asian countries. Mushrooms are used as food and have well-known medicinal properties due to their antioxidants and immunomodulatory attributes. Mushrooms have also gained interest as functional foods and nutraceuticals (Abd Malek et al., 2012). Edible mushrooms are potential sources of dietary fiber due to chitin and other hemicelluloses, mannans, and polysaccharides. Beta-glucans are dominant glycans in mushrooms, having immune-stimulatory potency. Among more than 15,000 known mushroom species, about 1800–2000 are traditionally considered edible while about 600–700 species are known to have medicinal values (Okwulehie and Odunze, 2004).

The tropical mutualistic fungus *Termitomyces* Heim is an obligate exosymbiont of mound-building termites and the fungus cultivator subfamily Macrotermitineae. Fungal databases vary in giving correct estimates of known identified *Termitomyces* taxa, such as Mycobank (50 records) and Catalogue of Life (70 records), but the highest number is reported by the fungus database Index Fungurom (95 taxa) (Table 17.1). The fruiting bodies of these mushrooms appear at the onset of the monsoon and grow on termitaria in forest- or savannah-like soils from June to October. These termitophilic species are valued as being edible, tasty, and nutritious (Aryal and Budathoki, 2016). Nutritional constituents such as proteins, essential amino acids, macro- and micronutrients, vitamins, and fiber and taste components from *Termitomyces* fruitbodies have been reported. These have high protein (31%–37%) and carbohydrates (32%) and low lipid content (Adejumo and Awosanya, 2005; Ogundana and Fagade, 1982). This chapter attempts to highlight the chemical creativity of *Termitomyces* that is useful in biomedical applications. This chapter excludes data related to enzymes and proteins reported from this genus, which are being published separately.

During the past few decades, more attention has been paid to explore the chemical creativity of mushrooms, as these are sources of new compounds capable of improving biological functions that can also be used as dietary supplements and for other medicinal purposes (Chang and Buswell, 1996; Chang, 2008). Chinese and Japanese biomedicinal research has shown that large numbers of higher fungi have potential benefits in ameliorating oncological cases; controlling viral pathogens; and helping with diseases due to high cholesterol, clumping of blood cells, and elevated blood pressure (Wang et al., 1998). Hence, mushrooms with medicinal properties are used to explore their antioxidant, antitumor, and antimicrobial properties as well as for nutraceutical and pharmaceutical products (Kidd, 2000; Ferreira et al., 2010). Screening the *Termitomyces* species for chemical creativity has revealed the presence of compounds unique to the species, especially neuritogenic/extracellular polysaccharides as well as some not-so-unique compounds such as alkaloids and pigments and some common compounds such as organic acids, phenols, and vitamins.

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