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EDITED AND REVIEWED BY
Elliot Berry,
Hebrew University of Jerusalem, Israel

*CORRESPONDENCE

Dibya Jyoti Hazarika
✉ dibya.hazarika@aau.ac.in

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Editorial: Mushrooms as functional foods and nutraceuticals

Dibya Jyoti Hazarika^{1*}, John Ayobami Amao²,
Robin Chandra Boro³ and Giuseppe Venturella⁴

¹Assam Agricultural University – Zonal Research Station, Gossaigaon, Kokrajhar, Assam, India,

²Department of Pure and Applied Biology, Ladoke Akintola University of Technology, Ogbomosho,

Nigeria, ³Department of Agricultural Biotechnology, Assam Agricultural University, Jorhat, Assam,

India, ⁴Department of Agricultural, Food and Forestry Sciences, University of Palermo, Palermo, Italy

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Editorial on the Research Topic

Mushrooms as functional foods and nutraceuticals

Mushrooms have been considered as a part of human diet and traditional medicine systems from time immemorial, due to their high nutritive and therapeutic values. In the present scenario, commercial mushroom cultivation and value addition has gained significant interests based on the experimental evidences on the nutritional and therapeutic importance of edible and medicinal mushroom species. Most of the edible mushrooms contain low fat, high protein, high dietary fiber, and significant amount of vitamins and minerals, which make them ideal food for a healthy lifestyle. Moreover, experimentally proven medicinal properties of mushrooms, such as anticancer properties, neuroprotective properties, antidiabetic activities, immunomodulatory activities, etc. have increased the attention of scientific communities to attract their focus on mushroom-based therapeutics. Global population increase demands the use of mushrooms as potential functional food and nutraceuticals. This Research Topic presents some of the excellent contributions in the field of mushroom research that explain the nutritive and medicinal values of some medicinally important culinary mushroom species.

Vitamin D is crucial, regulating body's calcium level and improving bone health, teeth health, immunity and overall physiological health including the nerve and muscle functions. Deficiency of vitamin D in the body leads to a number of health consequences including osteoporosis, muscle weakness, diabetes, hypertension, multiple sclerosis, metabolic syndrome, autoimmune diseases, and cancers. [Starck et al.](#) describes the potentiality of utilizing edible mushrooms as a source of Vitamin D. They mentioned that UV-exposed edible mushrooms (such as *Agaricus bisporus*) can provide sufficient amount of vitamin D (in vitamin D2 form) for daily intake with high stability during cooking and processing. As mushrooms are not included as a source vitamin D in dietary guidelines of various countries, this article claims that UV-exposed mushrooms with high vitamin D2 content can serve as a food-based source of vitamin D2 and hence, these should be considered in dietary guidelines for combating vitamin D deficiency.

Mushroom polysaccharides possess a range of biological activities including antidiabetic, antitumor, immunomodulatory and antioxidant properties. Moreover, these polysaccharides can regulate the gut microbial diversity and functional properties, thus

providing indirect health effects. Many of the edible mushrooms such as *Agaricus bisporus*, *Laetiporus sulphureus*, *Lentinula edodes*, *Tricholoma matsutake*, etc. are excellent source of bioactive polysaccharides, however their extraction methods require optimization for better extraction of bioactive polysaccharides. Xu et al. describes an ultrasound-assisted optimized extraction method for obtaining polysaccharides from *Tricholoma matsutake* fruiting bodies. They considered different parameters such as solid-to-liquid ratio, extraction time, extraction temperature, and ultrasonic power on polysaccharides yield from *T. matsutake*. Based on the statistically designed optimal conditions, they reported that the polysaccharides yield was as high as 16.97%, which was equivalent to the predicted value of the regression model (16.85%). Further, they reported that the polysaccharides of *T. matsutake* is composed primarily of fructose, glucose, mannose, and galactose, and these polysaccharides possess high antioxidant activity. Zhu et al. evaluated the polysaccharides from *Laetiporus sulphureus* for their efficiency on the growth of gastrointestinal probiotics and their *in vitro* role in the digestion process. Based on different mathematical models, *L. sulphureus* polysaccharides (LSP) showed promising effects on the growth of gut bacteria such as *Lactobacillus plantarum*, *Clostridium tyrobutyricum*, *Streptococcus thermophilus*, and *Bifidobacterium adolescentis*. Further, it has been established that the LSP could increase the survivability of beneficial gut bacteria in the presence of gastric juice, thus indicating the enhanced survivability and probiotic effect of these bacteria in the gastrointestinal tract.

Soluble dietary fibers of mushrooms have promising nutraceutical values and perform vital function in body's metabolic process. Dietary fiber promotes gastrointestinal peristalsis, enables easy digestion and absorption of food, thus minimizing the risk of several diseases such as obesity and diabetes. Guo et al. studies the effect of soluble dietary fiber of *Lentinula edodes* (Berk.) Pegler on the metabolism of lipids and also describes its ability to protect the liver in mice model served with high-fat diet. This study described that dietary fiber ingestion could effectively reduce the levels of alanine transaminase, aspartate transaminase, acid phosphatase, low-density lipoprotein cholesterol, transglutaminases, etc. and increase the γ -glutamyl transferase, high-density lipoprotein cholesterol and catalase levels in blood. This study provides an experimental basis for utilizing soluble dietary fiber of *L. edodes* in combating oxidative stress, liver injury and lipid metabolism disorder caused due to the consumption of high-fat diet.

Several mushrooms contain bioactive compounds that possess hypoglycemic properties and their consumption can combat high blood sugar levels in diabetic people. *Pholiota nameko*—a culinary mushroom has been recently investigated for its antidiabetic potential using C2C12 myotubes. Vong et al. reported that the hot water extract of *Pholiota nameko* could stimulate glucose uptake in C2C12 myotube cells and alleviate insulin resistance induced using palmitate. The extract contains polyphenols such as 4-hydroxybenzoic acid and cinnamic acid and exhibits antioxidant properties with no toxicity, suggesting its potential role in diet-based treatment of diabetes.

Our Research Topic provides detailed scientific idea of the nutraceutical properties of some selected mushroom species. Undoubtedly, there are numerous mushrooms that remains unexplored till date for their bioactive properties, which needs the attention of mushroom researchers. Integration of genomics, metabolomics and other machine learning platforms for drug designing and scientific studies will offer a promising scope for advancing research on mushrooms for establishing them as a source of nutraceuticals and pharmaceuticals.

Author contributions

DH: Conceptualization, Writing – original draft, Writing – review & editing. JA: Writing – review & editing. RB: Supervision, Writing – review & editing. GV: Supervision, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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