

# A Review: Health Benefits and Quality Value of Mushroom

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## ABSTRACT

For a very long period, several mushrooms have been consumed and utilised as medications; the Greeks thought they gave warriors vigour in combat, and the Romans thought of them as "Food of the Gods." Mushrooms have long been revered in Chinese culture as a wholesome dish and a "elixir of life." They have been a part of human culture for countless years, and because of their sensory qualities, they have attracted a great deal of interest in the most significant civilizations in history. They are also known for having appetising culinary qualities. Because they are minimal in calories, carbohydrates, fat and sodium, as well as being cholesterol-free, mushrooms are a valuable food in today's society. In addition, mushrooms offer significant amounts of protein, fibre, selenium, potassium, riboflavin and vitamin D. Studies have revealed that mushrooms have a variety of bioactivities, including antioxidant, anti-inflammatory, anticancer, immunomodulatory, antimicrobial, hepatoprotective, and antidiabetic properties. As a result, they have gained more attention in recent years and may one day be developed into functional foods or medications for the prevention and treatment of a number of chronic diseases, including cancer, cardiovascular disease, diabetes mellitus, and neurodegenerative diseases. It has been claimed to have positive health effects and be effective in treating some ailments. Mushrooms are essential sources of bioactive chemicals and also have antimicrobial, immunological system, and cholesterol-lowering properties. Some mushroom extracts are utilised to support human health and are available as dietary supplements as a result of these qualities. Therefore, the current review provides a summary of the bioactivities and health advantages of mushrooms, which may be helpful for making the best use of mushrooms.

**Keywords:** mushroom, health benefits, antioxidant, anticancer, anti-inflammatory and anticancer

## INTRODUCTION

Mushrooms are widely distributed food resource on the planet that has been utilized for over 2000 years because of their nutritional value and medicinal characteristics. Mushrooms have been found to boost human health due to their nutrients, which include digestible proteins, carbohydrates, fibre, vitamins, minerals, and antioxidants (Acharya *et al.*, 2017). Polysaccharides, alkaloids, terpenoids, lactones and lectins are among the bioactive substances investigated extensively in medicinal mushrooms, widely utilized in eastern Asia (Toledo *et al.*, 2016). Nagy *et al.* (2017) examined the content, production, and function of bioactive mushroom polysaccharides. Mushrooms are more important food in our diet due to their medicinal properties. Human require all 9 essential amino acids

viz., Methionine, phenylalanine, leucine, lysine, isoleucine, tryptophan, valine, serine and threonine, which are all present in mushroom protein. Mushrooms are a good source of additional minerals including iron, phosphorus, and vitamins like, ascorbic acid, riboflavin, ergosterol, thiamine and niacin in addition to high protein content. Secondary metabolites (sterols, terpenoids, organic acids, alkaloids, polyphenols, lactones, metal chelating agents, sesquiterpenes, nucleotide analogues and vitamins) glycoprotein and polysaccharides, primarily 1, 2-glucans, are found in mushrooms. They are employed as antiviral, anticancer, immunopotentiating, hepatoprotective and hypocholesterolemic medicines because they contain biologically active chemicals of therapeutic potential (Rahi *et al.*, 2016).

### Worldwide scenario of mushroom production

Mushrooms have a various advantages, including ease of cultivation, role in bioremediation and biodegradation, formation of extracellular enzymes, and creation of nutraceutical properties. *Pleurotus* species, sometimes known as oyster mushrooms, are edible fungi that are widely grown around the world, particularly in Southeast Asia, India, Africa, and Europe. Oyster mushrooms are the third-largest commercially grown fungus in the planet. According to Sanchez (2010), *Pleurotus ostreatus* is world's second-largest cultivated mushroom species, behind *A. bisporus*. Mushroom farming is China's 5<sup>th</sup> largest agricultural sector (Zhang *et al.*, 2014). Due to large expanded status of the mushroom farming, the price of mushrooms decreases progressively. Only a few edible mushrooms (*Agaricus*, *Pleurotus*, *Volvariella*, *Lentinula*, *Auricularia*, *Tremella*, *Flammulina* and a couple of others) can be produced, whether they constitute a globally significant agricultural product. When *A. bisporus* was cultivated in a composted substrate in France in the 17<sup>th</sup> century, it made the greatest significant advancement in mushroom growing. China, the US and the Netherlands are the world's leading mushroom producers, with a major portion of their output being exported. Every year, 400 lakh tonnes of mushrooms with nutritional and therapeutic characteristics are produced across the world. It is rising at a pace of 8% to 10% every yr. China produces around 85% of the world's total mushroom production. In India, 1.44 lakh metric tonnes of mushroom are produced each year, and this number is steadily rising. In comparison to affluent nations, India has an extremely low mushroom consumption per capita. In China, per capita mushroom intake ranges from 20 to 22 kg per year. India, on the other hand, consumes roughly 100 grams of sugar each person. In order to promote its consumption in the country, efforts are being undertaken to improve its quality and nutritional content. In the United States, the total amount of sales for the 2020-2021 mushroom crops was 758 million pounds, down 7% from the previous season (USDA, 2021).

In India, total mushroom production is around 0.26 million tonnes with white button mushrooms account for 73% of total mushroom production worldwide, followed by oyster mushrooms (16%), paddy straw mushrooms (7%) and milky mushrooms (3%). In India, four mushroom types have been recommended for year-round cultivation: *A. bisporus*, *Volvariella* spp., *Pleurotus* sp., and *C. indica*. The Indian subcontinent is known around the globally for its diverse agro-climatic zones and ecosystems that support a diverse mushroom species (Thakur *et al.*, 2011).

### Mushroom's Market status

Edible mushrooms, particularly specialized mushrooms like oyster and shiitake mushrooms, have a high market value. In the United States, sales for the 2020-2021 mushroom crops were \$1.06 billion, down 8% from the previous season. The average reported pound price was \$1.40, down a penny from

the previous year. Sales of commercially produced specialty mushrooms such as Shiitake, Oyster, and all Other Exotics totaled \$66.1 million in 2020-2021, down 2% from the previous two seasons (USDA, 2021). The oyster mushroom is a popular cooking and eating fungus, and it has a reputation for being simple to grow. Sales of commercially farmed speciality mushrooms such as Shiitake, Oyster, and all other exotics mushrooms totalled \$67.4 million in the 2019-2020 seasons, up 2% from the previous year. A specialized grower is one who produces at least 200 natural wood logs or has a commercial indoor growing facility and sells \$200 or more. Growers got an average price of \$3.37 per pound, down 7 cents from the previous season's revised forecast (USDA, 2021). They're also regarded premium eating mushrooms, mostly popular in many Asian cuisines. The specialty mushroom sector is expected to thrive in the future, based on historical and recent patterns. Mushroom agriculture is a delightful need to Indian agricultural because of hike value, unique production requirements, and very short growing cycle.

### **Mushroom's nutritional properties**

Mushrooms are regarded a full, healthy diet that is excellent for people of all ages, from children to the elderly. Several factors influence the nutritional amount of mushrooms, including species, stage of development, and environmental circumstances. Mushrooms are a good source of protein, fibre, vitamins, and minerals (Thatoi *et al.*, 2014). Mushrooms are a high-protein, vitamin, and mineral-rich food. It contains about sugar (17-44%), protein (25-30%), mycocellulose (7-38%), fat (2.5%) and minerals (potassium, phosphorus, calcium, and sodium. The nutritional component is determined by the substrate on which they are grown (Chakrabort *et al.*, 2017). Cultivated mushrooms are higher in protein and minerals, lower in fat, and high in vitamins B, D, and K, with the presence of vitamins A and C on rare occasions. Methionine, arginine, alanine, isoleucine, lysine, glutamic acid, histidine cysteine, aspartic acid, tyrosine, valine, phenylalanine, glycine, tryptophan, serine, and proline are among the eighteen essential amino acids found in mushrooms. Mushrooms also contain important unsaturated fatty acids such as oleic, linoleic, alpha-linolenic and palmitic acids (Chakrabort *et al.*, 2017).

### **Mushroom's medicinal and therapeutic properties**

Mushrooms are also known for being a treasury source of physiologically active chemicals (Thakur, 2020). Anti-cancer agents including fatty acids, polysaccharides, ergosterol, N,N,N-tris "hydrazine carbonyl" phosphoric triamide, selenium, and vaccenic acid; anti-hypercholesterol agents including glycoproteins, sterols, fatty acids, and vaccenic acid; anti-microbial agents including (Hamman *et al.*, 2016). Glucan and G-glucan; phenols; polyketides, triterpenoids, and sterols; triterpenoids, lectins, glycoproteins, ergothioneine; selenium, pyran derivative, essential fatty acids. Mushrooms are used not for their culinary value due to their distinct flavour and aroma 18, but also for the possible therapeutic benefits as well as their effectiveness in treating and preventing a variety of illnesses (Belman *et al.*, 2019). Phenolic chemicals, polysaccharides, terpenoids, steroids, lectins, glycoproteins, and various lipid components are among the bioactive metabolites. Several research have been conducted to show that mushroom extracts and secondary metabolites, such as antioxidants, have bioactive characteristics, antitumor, antimicrobial, immunomodulator, antiatherogenic, hypoglycemic, and anti-inflammatory (Taofiq *et al.*, 2015). Mushrooms are also regarded as functional foods because of their beneficial effects on humans (Patel *et al.*, 2012).

**Anticancerous property**

The main cause of death worldwide is cancer. The demand for safer, more efficient chemoprevention therapies for human cancer has grown recently. Fruits and medicinal plants are examples of natural goods that have demonstrated antiproliferative properties (Zhang *et al.*, 2016). Numerous studies have shown that mushrooms significantly suppress the growth of cancerous cells in the breast, hepatocellular carcinoma, uterine cervix, pancreas, stomach, and acute leukaemia. Various varieties of mushrooms have also been found to contain anticancer chemicals (Zhang *et al.*, 2016).

**Antimicrobial property**

Numerous synthetic antimicrobial drugs have been found and produced during the past century, but drug resistance and toxicity remain the main obstacles to attaining therapeutic benefits. Thus, it is essential to look for effective and safe medications to treat infectious infections. Ingredients for herbal medicines, including mushrooms, are regarded as a trustworthy source in this situation. Several types of mushrooms have shown potential for having antibacterial, antifungal, and antiviral properties (Zhang *et al.*, 2016).

**Antioxidant property**

An excessive amount of free radicals can harm proteins, lipids, and DNA, which can lead to a number of chronic diseases like cancer, cardiovascular disease, and neurological disorders. Vegetables, fruits, edible flowers, cereal grains, and medicinal plants are just a few examples of natural goods that are rich in natural antioxidants, which can snare free radicals and be utilised to prevent some diseases brought on by oxidative stress. The antioxidant activity of mushrooms, which includes suppression of lipid peroxidation, decrease of human low-density lipoproteins, scavenging of free radicals, etc., has received considerable research attention (Zhang *et al.*, 2016).

**Anti-inflammatory property**

For thousands of years, medicinal mushrooms have been essential ingredients in traditional Chinese herbal remedies. A crucial component of medicinal mushrooms' ability to generate positive health effects is their anti-inflammatory capacity (Zhang *et al.*, 2016).

**Immunomodulatory property**

The ability of immunomodulatory action to protect people from numerous diseases is thought to be essential. Numerous mushrooms, including *Ganoderma lucidum*, *Lentinus edodes*, *Schizophyllum commune*, and *Grifola frondosa*, are significant natural sources of immunomodulatory chemicals (Zhang *et al.*, 2016).

**Anti-aging property**

Mushroom polysaccharides are effective super oxide free radical scavengers. These antioxidants restrict the body's ability to produce free radicals, which slows down the ageing process. For healthy eyes, kidneys, bone marrow, liver, and skin, ergothioneine, a particular antioxidant present in *Flammulina velutipes* and *Agaricus bisporus*, is essential (Zhang *et al.*, 2016).

## CONCLUSION

Numerous bioactivities, including antioxidant, anti-inflammatory, immunomodulatory, anti-cancer, anti-diabetic, hepatoprotective, and antibacterial ones, have been linked to a variety of mushrooms. In order to prevent and treat a variety of chronic diseases, including cancer, diabetes mellitus, hyperlipidemia, and hypertension, functional meals derived from a variety of mushroom species may one day be created. Popular mushrooms have so far received substantial evaluation, but unusual mushrooms have received less attention. As a result, research into the function of a wide variety of mushrooms, particularly unidentified varieties, on human health is still relatively undeveloped. Future research should thoroughly assess the bioactivities of a few underutilised mushrooms, and more bioactive substances should be extracted and discovered. The active components' modes of action deserve special consideration. Additionally, certain mushrooms with a variety of health advantages ought to be turned into functional meals or medications for the treatment and prevention of a number of chronic disorders.

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