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MEDICINALLY IMPORTANT MUSHROOMS

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Abstract

Mushrooms are being used by mankind since prehistoric period due to their nutritional as well as nutraceutical values. Many mushrooms contain medicinal properties including *Agaricus blazei*, *Auricularia* sp., *Coprinus comatus*, *Fomes fomentarius*, *Grifola frondose*, *Ganoderma lucidum*, *Hericium erinaceus*, *Lentinula edodes* and *Coriolus versicolor* and *Cordyceps* sp. Pharmacological properties of these medicinal mushrooms are mainly conferred by some bio-active compounds like polysaccharides, protein, triperpenoids, phenols, ergosterol, etc. and many enzymes like laccase, glucose oxidase, superoxide dismutase, and peroxidase. These compounds help as anti-inflammatory, anti-allergic, antioxidant, anti-aging, anti-infection, cure cardiovascular, hepatoprotective, neuroprotective, enhance bone strength and even cure carcinogenic reactions in human body. In addition, certain compounds derived from medicinal mushrooms are being used in drug-discovery pathway. Incorporation of regulatory amount of such mushrooms in diet can reduce many diseases especially oxidative stress related issues. There is a need to increase the awareness of such natural foods among people to promote the cultivation and consumption, so the overall health and new emerging diseases can be regulated in our daily routine.

Keywords : Medicinal Mushrooms, Nutraceutical values, Oxidative stress, Immune system.

Introduction

Fungi have great importance in human's life as well as the environment. Mushrooms are macro fungi with a distinctive fruiting body which can be either hypogeous (underground) or epigeous (above ground) and large enough to be picked by hand and to be seen with the naked eye. For thousands of years, Mushroom have been revered and regarded by humans as edible as well as medicinal food in which different mushrooms such as Reishi or Lingzhi, *Cordyceps* and Shitake have been discussed in ancient Asian traditions for their nutraceutical properties.

Traditionally, mushrooms were used to treat and prevent diseases and to maintain good health, mainly by regulating the immune system. Nowadays, more than 50 mushroom sp. are used for more than 100 therapeutic properties including anti-inflammatory, antitumor, anticancer, antioxidant, antiviral, anti-diabetic, antifungal and anti-parasitic and the ability to lowers the cholesterol levels and modulate the immune response. Medicinal mushrooms also protect the liver, brain and heart from various diseases.

Along with medicinal benefits and physiological characteristics also great aroma and taste. Medicinal mushroom contains a rich source of nutrients such as fibers, carbohydrates, protein, vitamins, polyunsaturated fats and minerals. They also produce secondary metabolites, which are largely responsible for their therapeutic effects. These bio-active metabolites are low molecular weight compounds, these compounds are produced by an organism in response to certain stress conditions as a signaling and defense mechanism necessary for its survival.

Different medicinal mushrooms

Some of the medicinal mushrooms are listed below along with their therapeutic use.

***Agaricus blazei* (Royal Sun Agaricus):** It is a recently discovered culinary and medicinal mushroom and widely popular worldwide. The therapeutic properties include anti-allergic, anti-cancerous properties along with antiviral and hepatoprotective (liver protective) activities. It mainly cures leukaemia, ovarian, cervical, alimentary tract, endometrial and breast cancer in conjunction with chemotherapy via elevation in the immune response.

2.2 *Auricularia* sp. (Wood ear): Two main species i.e., *Auricularia polytricha* (black fungus, cloud ear) and *Auricularia auricula* (Jew's ear) of this mushroom are well known for their rubbery and crunchy texture. Therapeutic values are due to high levels of antioxidative compounds such as polyphenols and polysaccharides that help as cardiovascular protective, however they are not recommended during pregnancy.

2.3 *Coprinus comatus* (Shaggy Mane): *Coprinus comatus* is a delicious mushroom is suitable as edible only in young stage. It is not generally considered medicinal mushroom but is known for its high antioxidants such as γ -aminobutyric acid (GABA), relieve anxiety and insert relaxing effects in muscles and nerves. Its role in reducing blood sugar levels is also reported.

***Cordyceps* spp. (Caterpillar Fungus):** *Cordyceps* is a genus of unique fungal species that are parasitic primarily on arthropods and insects, and includes two species, *Cordyceps militaris* and *Cordyceps sinensis* (caterpillar fungus, *Ophiocordyceps sinensis*). The main bio-active compounds in *Cordyceps* sp. are cordycepin, lovastatin, various polysaccharides, ergosterol and melanin. *Cordyceps* is traditionally used as a tonic against fatigue, for fertility and prevention and cure of osteoporosis, cancer and respiratory diseases such as bronchitis, asthma and chronic obstructive pulmonary diseases. This mushroom also protects heart, kidney and liver and hence called as anti-aging mushroom.

2.5 *Fomes fomentarius* (Tinder Fungus): *Fomes fomentarius* is an inedible fungus, where its fruiting bodies are used as tinder for wounds and to stop bleeding, cure rheumatism, body pain, haemorrhoids, painful menstruation, uterine cancer and bladder disorder (Valverde 2015).

2.6 *Ganoderma lucidum* (Reishi, Lingzhi): *Ganoderma lucidum* is one of the most famous medicinal mushrooms and is called Reishi or Lingzhi denoting "mushroom of immortality", divine and miraculous due to its extraordinary therapeutic properties. They contain certain polysaccharides that enhance the immune system and Triterpenes that act as anti-inflammatory and antitumor agents. Furthermore, the sedative effects of Reishi help to relieve anxiety and insomnia and are recommended for mental stabilization.

2.7 *Grifola frondosa* (Maitake, Hen of the Woods): It is a medicinal mushroom, also known as maitake. It contains polysaccharide extracts, maitake MD-fraction and maitake D-fraction, used for the treatment of various types of cancer. These polysaccharide improves the immune response, hypertension and diabetes along with antiviral, antioxidant, antimicrobial properties and hence increases vitality.

2.8 *Hericium erinaceus* (Lion's Mane): This mushroom is well known for its neuroprotective properties and that is why called as "natural's nutrient for the neurons". It improves brain function, relieves anxiety, depression, prevents dementia and other neurodegenerative diseases via antioxidative properties and lowering cholesterol and sugar level. It also stimulates immune system and exerts its antitumor activities against oesophageal and gastric cancer.

2.9 *Lentinula edodes* (Shiitake): *Lentinula edodes* or shiitake is a very popular and delicious mushroom with medicinal properties and high nutritional value. It is named as "elixir of life" which

promotes energy and vitality. Shiitake is the most studied medicinal mushroom and it is valued for its nutritional, therapeutic as well as culinary properties. Shiitake strengthens the immune response, prevents diabetes and cardiovascular diseases, exhibit anti-inflammatory, antitumor and hepato-protective activity. It also helps in skin and respiratory allergies.

2.10 *Trametes versicolor/ Coriolus versicolor* (Turkey Tail): *Trametes versicolor* or *Coriolus versicolor* is clinically important and one of the most studied medicinal mushrooms used for the prevention and treatment of a variety of cancers due to two polysaccharide-protein complexes, called as Polysaccharide- Peptide) and Polysaccharide-K or Krestin, the compounds effective as immunotherapeutic in oesophageal, uterine, colorectal, nasopharyngeal, breast and lung cancer management.

Cultivation and production

Overview of medicinal mushroom cultivation and its requirements is given in Table no.1.

Table 1.: Requirements of medicinal mushroom cultivation

Name of mushrooms	Substrate for Spawn	Raw material/ Compost	Temperature	pH
<i>Agaricus blazei</i>	WC, SD	WC, Ba, Ba + WS+ RS	23-27°C for My, 22-25°C for FB development	7.5 for compost, 7.7 for casing
<i>Auricularia spp.</i>	Sorghum grain	SD (72%) + RB (28%)	28°C for My, 27°C for FB development	6.0
<i>Coprinus comatus</i>	Rye Grain	Cotton Waste, Corn Cobs, RS	21-27°C for My and 16-21°C for FB development	6.5-7.5
<i>Cordyceps Spp.</i>	PDB, Novel Liquid Culture	Rice, Soya bean, Wheat	21-27°C for My and 16-21°C for FB development	6.5-7.5
<i>Ganoderma lucidum</i>	Rice, Wheat, Barley	Blocks of hardwood, Straw	25-30°C for My and 24-28°C for FB development	6.5-7.5
<i>Grifola frondose</i>	Grains, SD, Cotton seed hulls	Blocks of Hardwood, SD	18-22°C for My and 15-20°C for FB development	5.5-6.5
<i>Hericium erinaceus</i>	Rye, Wheat, Millet	Hardwood + SD, RS, WS, RS + WS	22-27°C for My and 20-25°C for FB development	7.0
<i>Lentinula edodes</i>	SD		25-28°C	Near 7.0
<i>Coriolus versicolor</i>	Sorghum grains	Hardwood, SD + WB	28 °C	Near 7.0

WC= WoodChips, SD= Saw Dust, Ba= Bagasse, WS= Wheat Straw, RS= Rice Straw, RB= Rice Bran, WB= Wheat Bran, My = Mycelium (Zhou 2021, Shin et al. 2021)

Conclusion

As we have so many species of medicinal mushrooms with well demonstrated evidences of their therapeutic properties. In the present era of life, our health issues are increasing day by day with

new emerging diseases. So, there is a need to add natural value-added food products such as mushrooms with nutraceutical values in our daily diet. As we have discussed different therapeutic properties, consumption of these medicinal mushrooms will enhance our immune system, reduce cholesterol levels and hence cardiovascular problems. Anti-cancerous mushrooms will help in relieving and curing tumour formations. Even their regulated amounts can improve the overall health and vitality. So, there is need to enhance the awareness and promote the cultivation and consumption of these mushrooms in India, which are traditionally consumed in other countries.

Reference

- El-Maradn Y.A, El-Fakharany E.A, Abu-Serie M, Hashishb M.H and Heba S (2021) Lectins purified from medicinal and edible mushrooms: Insights into their antiviral activity against pathogenic viruses *Int J Biol Macromol* 179:239-58.
- Shin H.S, Leyva-Gomez G, Prado-Audelo M.L.D, Cortes H, Singh Y.D, Panda M.K, Mishra A.P, Nigam M, Saklani S, Kumar P, Cruz-Martins N, Sharma V, Garg N, Sharma R and Patra J.K (2021) *Cordyceps* spp.: A Review on Its Immune-Stimulatory and Other Biological Potentials | *Pharmacology. Frontiers* 1: 16-42.
- Singh R (2017) A review on different benefits of mushrooms *J Pharm Biol Sci* 12:107-11.
- Valverde M.E, Hernández-Pérez T and Paredes-López O (2015) Edible Mushrooms: Improving Human Health and Promoting Quality Life. *Int J Microbiol* 37:1-15.
- Wang H, Fu Z and Han C (2013) The medicinal values of culinary-medicinal royal sun mushroom (*Agaricus blazei* Murrill). *Evidence-Based Complementary and Alternative Medicine*.
- Win T and Ohga S (2018) Study of the cultivation of *Agaricus blazei* grown on compost mixed with selected agro-residue. *Adv microbial* 8(10): 778-89.
- Zhou X (2021) Cultivation of *Genoderma lucidum*: Technology and application. *Edible Med Mushrooms* 2:385-413.