

A Review: “Health Benefits of Mushrooms”

Sabiha Naz,

Department of Biotechnology and Microbiology, Bhilai Mahila Mahavidyalaya,
Hospital, Sector Bhilai -490009, C.G. India

Abstract

An estimated 38,000 species of mushrooms are present most provide a wealth of protein, fiber, **Vitamins B and C**, as well as calcium and other minerals. And at least three species have demonstrated phenomenal healing potential: Maitake, Shiitake and Reishi. These medicinal mushrooms have been shown to boost heart health; **reduce** the risk of cancer; promote immune function; ward off viruses, bacteria, and fungi; reduce inflammation; combat allergies; help balance blood sugar levels and support the body's detoxification mechanisms. Many species of mushrooms used in folk medicine for thousands of years are under intense study by ethnobotanists and medical researchers. This study discussed on the medicinal properties of various edible and extractable mushrooms.

KEYWORD: - Maitake, Shiitake, Reishi, Medicinal mushrooms, Edible mushrooms.

INTRODUCTION:

Today, medicinal mushrooms are burgeoning in popularity in the **U.S.** This new public interest has been greatly stimulated by the large number of scientific studies that have been conducted on medicinal mushrooms, confirming many of their traditional uses and finding new applications. Mushrooms have been treasured as remedies for disease and as natural health supports for thousands of years and are an incredibly popular food in most countries. Actually, world trade in mushrooms is as big as the trade in coffee ^[1,2,3].

According to an analysis of a large, national dataset containing 24-hours food intake information and health data for a large representative sample of the entire U.S. population (Third National Health and Nutrition Examination Survey of 20,050 adults), mushroom eaters have a better nutrient profile than do those who do not eat mushrooms. The analysis, conducted by Block Dietary Data Systems (Berkeley, CA) also discovered that mushroom eaters have greater intake levels of most vitamins and minerals and in some cases consume less alcohol, fat, and sodium ^[4]. A greater percentage of mushroom eaters than non-mushroom eaters met the Recommended Daily Allowance (RDA) and Daily Recommended Intake (DRI) for the following 19 nutrients: **Calcium, Copper, Iron Magnesium, Phosphorus, Zinc, Folate, Niacin, Riboflavin, Thiamin, Vitamins A, B6, B12, C, And E, Energy, Carbohydrate, Fiber, Protein** ^[5, 6, 7, 8].

Medicinal mushrooms also behave as adaptogens, which means that they perform broad-based, nonspecific actions in the body, supporting the function of all of its major systems, including the nervous, hormonal and immune systems, and bolstering the body's resistance to the onslaught of toxic environmental influences, noise, emotional stress and pathogens, like bacteria and viruses. Adaptogens are especially noted for their ability to build endurance and reduce fatigue ^[9, 10, 11, 12, 13].

Beta-glucans, found in numerous mushroom species, have shown marked immunity-stimulating effects, contribute to resistance against allergies and may also participate in physiological processes related to the metabolism of fats and sugars in the human body. The beta-glucans contained in oyster, shiitake and split gill mushrooms are considered to be the most effective ^[14].

Higher fungi in traditional and modern medicine. The medicinal use of mushrooms so-called higher fungi, has a very long tradition in the Asian countries, whereas their use in the Western hemisphere about the most important medicinal has been slightly increasing only since the last decades. The paper gives an overview mushrooms and summarizes the actual knowledge about chemistry and pharmacology of *Lentinula edodes* (Shiitake, Golden Oak Mushroom), *Ganoderma lucidum* (Reishi, Ling Zhi), *Agaricus brasiliensis* (Royal sun agaricus), *Grifola frondosa* (Maitake, Hen-of-the-Woods) and *Hericium erinace* (Yamabushitake, Lion's Man, Monkey's Head) ^[6].

CONCLUSION:

Edible mushrooms have important salutary effects on health or even in treating disease. Mushrooms are valuable health food - low in calories, high in vegetable proteins, chitin, iron, zinc, fiber, essential amino acids, vitamins & minerals. Mushrooms also have a long history of use in Traditional Chinese Medicine. These studies suggest that Mushrooms are probiotic - they help our body strengthen itself and fight off illness by maintaining physiological homeostasis - restoring our bodies balance and natural resistance to disease. A mushroom characteristically contains many different bioactive compounds with diverse biological activity, and the content and bioactivity of these compounds depend on how the mushroom is prepared and consumed (Table-II and III). Mushrooms contain numerous substances including glycoproteins, glyconutrients, lectins, etc. The compounds they contain have been classified as Host Defense Potentiators (HDP) which can have immune system enhancement properties. That is one of the reasons they are currently used as adjuncts to cancer treatments in Japan and China. "In Japan, Russia, China, and the U.S.A. Several different polysaccharides anti tumor agents have been developed from the fruiting body, mycelia, and culture medium of various medicinal mushrooms (*Lentinus edodes*, *Ganoderma lucidum*, *Schizophyllum commune*, *Trametes versicolor*, *Inonotus obliquus*, and *Flammulina velutipes*) (Table-I). Both cellular components and secondary metabolites of a large number of mushrooms have been shown to effect the immune system of the host and therefore could be used to treat a variety of disease states."

It is estimated that 50% of the annual 5 million metric tons of cultivated edible mushrooms contain functional "nutraceutical" or medicinal properties. In order of decreasing cultivated tonnage, *Lentinus* (shiitake), *Pleurotus* (oyster), *Auricularia* (muer), *Flammulina* (enokitake), *Tremella* (yin-er) *Hericium*, and *Grifola* (maitake) mushrooms have various degrees of immunomodulatory, lipid-lowering, antitumor, and other beneficial or therapeutic health effects without any significant toxicity ^[6]. Lentinan is often given as part of a combination therapy for cancer in addition to conventional

cytotoxic drugs ^[15] Although the data for this functional food class are not as strong as those for other functional foods such as cruciferous vegetables, because of their potential usefulness in preventing or treating serious health conditions such as cancer, acquired immune deficiency syndrome (AIDS), and hypercholesterolemia.

REFERENCES:

- 1.) **Chilton, J. (1993).** What are the health benefits of mushrooms? Let's Live, Dec., pp. 24-29.
- 2.) **Chang, R. (1996).** Functional properties of edible mushrooms. *Nutr. Rev.* **54(11)**: pp. S91-S93.
- 3.) **Chang, S.T. (2003).** Mushroom biology: The impact on mushroom production and mushroom products. In: Chang ST, Buswell JA, Chiu SW, eds. *Mushroom Biology and Mushroom Products*. Hong Kong: Chinese University Press. pp. 3-20.
- 4.) **Maheshwari, R., Chauhan V., (2012).** Health Benefits of Edible Mushrooms: A Mini Review. *Bull. Environ. Pharmacol. Life Sci.*; **1 [9]**: pp. 92 – 93.
- 5.) **Dharmananda, S. (1988).** Medicinal Mushrooms. *Bestways Magazine*, July, pp. 54-58.
- 6.) **Wiley, C. (1991).** The medicinal side of mushrooms. *Vegetarian Times*, March
- 7.) **Smith, C. (1994).** Gold medal herbs. *Natural Health* May/June, pp. 85-87.
- 8.) **Law, D. (1996).** Fungi as a platform for new medicine. *Mushroom World*, December.
- 9.) **Ying J., Mao X., Ma Q., Zong Y. Wen H. (1987).** *Wen Icons of medicinal fungi from China*. Beijing: Science Press.
- 10.) **Hobbs, C. (1997).** Overcoming Chronic Fatigue (Traditional remedies for a modern disease). *Veggie Life*, **5(5)**: pp. 56-59.
- 11.) **Tochikura T, Nakashima H, Ohashi Y, Yamamoto N. (1988).** Antitumor activity of aqueous extracts of edible mushrooms. *Cancer Res.* **29**: pp.734-735.
- 12.) **Shirota, M., (1996).** What You Should Know About Medicinal Mushrooms. *Explore!* **7(2)**: pp.48-52.
- 13.) **Smith, J, Rowan, N., Sullivan, R. (2002).** *Medicinal Mushrooms: Their Therapeutic Properties and Current Medical Usage with Special Emphasis on Cancer Treatments*. London: Cancer Research UK.
- 14.) **Rop, O., Mlcek, J., & Jurikova, T. (2009).** Beta-glucans in higher fungi and their health effects. *Nutrition Reviews*, **67**: pp. 624-631.
- 15.) **Nimura H, Misumori N, Takahashi N., (2006).** S-1 combined with lentinan in patients with unresectable or recurrent gastric cancer. *Gan To Kagaku Ryoho.* **33(1)**: pp. 106-109.

Table-I: Different Medicinal Activities of Various Types of Mushroom

Activities	Mushrooms
Anticancer activities	<i>Agaricus bisporus</i> (Portobello) and <i>Agaricus subrufescens</i> (<i>Agaricus blazei</i>), <i>Inonotus obliquus</i> (Chaga)
Anticholesterol activity	<i>Aspergillus terreus</i> and <i>Pleurotus ostreatus</i> (oyster mushroom), <i>Penicillium citrinum</i> , <i>Monascus purpureus</i> , <i>Lentinula edodes</i> (shiitake)
Psychotropic activities	<i>Psilocybe</i> (magic mushrooms), <i>Claviceps purpurea</i> (ergot), <i>Polyozellus multiplex</i> (blue chanterelle) <i>Hericium erinaceus</i> (lion's mane), <i>Hericium ramosum</i> , <i>Boletus badius</i> (bay bolete)
Antiviral,	<i>Agaricus subrufescens</i> (<i>Agaricus blazei</i>), <i>Agrocybe aegerita</i> (pioppino), <i>Boletus edulis</i> (porcini), <i>Ganoderma applanatum</i> (artist's conk), <i>Physalospora piricola</i> , <i>Botrytis cinerea</i> , <i>Grifola frondosa</i> (maitake), <i>Hypsizygus tessellatus</i> (beech mushroom), <i>Kuehneromyces mutabilis</i> (sheathed woodtuft), <i>Lentinula edodes</i> (shiitake), <i>Piptoporus betulinus</i> (birch polypore), <i>Pleurotus eryngii</i> (king oyster mushroom), <i>Pleurotus ostreatus</i> (oyster mushroom)
Antibacterial	<i>Cantharellus cibarius</i> (chanterelle), <i>Fistulina hepatica</i> (beefsteak fungus), <i>Ganoderma applanatum</i> (artist's conk), <i>Lepista nuda</i> (blewit), <i>Laetiporus sulphureus</i> (chicken of the woods), <i>Piptoporus betulinus</i> (birch polypore), <i>Terfezia</i> (desert truffle)
HIV Inhibitors	<i>Boletus edulis</i> , <i>Cordyceps</i> , <i>Flammulina velutipes</i> (enokitake), <i>Hericium erinaceum</i> (lion's mane mushroom), <i>Inonotus obliquus</i> (chaga), <i>Lactarius camphoratus</i> (candy cap), <i>Lentinula edodes</i> , <i>Pleurotus ostreatus</i> , <i>Pleurotus pulmonarius</i> , <i>Poria cocos</i> , <i>Russula delica</i> (milk-white brittlegill), <i>Sparassis crispa</i> , <i>Trametes versicolor</i> (turkey tail mushroom), and <i>Umbilicaria esculenta</i>
Antifungal	<i>Cantharellus cibarius</i> (chanterelle), <i>Sparassis crispa</i> (cauliflower mushroom), <i>Lepista nuda</i> (blewit), <i>Lentinula edodes</i> (shiitake), <i>Piptoporus betulinus</i>
Antiparasitic	<i>Cordyceps</i> and <i>Stropharia rugosoannulata</i> , <i>Ganoderma lucidum</i> (reishi)
Nematicidal activity	<i>Pleurotus pulmonarius</i> (Indian oyster)
Glycemic activities	<i>Tremella fuciformis</i> (white jelly fungus), <i>Poria cocos</i> , <i>Ganoderma lucidum</i> (mannentake), <i>Auricularia auricula-judae</i> (jelly ear), <i>Agaricus campestris</i> (meadow mushroom), <i>Agaricus subrufescens</i> (<i>Agaricus blazei</i>), <i>Inonotus obliquus</i> (chaga), <i>Hericium erinaceus</i> (lion's mane), <i>Agrocybe aegerita</i> (pioppino), <i>Coprinus comatus</i> (shaggy mane),
Vitamin D	<i>Agaricus bisporus</i> (Portobello) <i>Grifola frondosa</i> (maitake), <i>Cantharellus cibarius</i> (chanterelle) and <i>Lentinula edodes</i> (shiitake)
Antihormone and anti-inflammatory activity	<i>Fomes fomentarius</i> (amadou), <i>Phellinus linteus</i> (mesima), <i>Ganoderma lucidum</i> (mannentake), <i>Inonotus obliquus</i> (chaga) <i>Geastrum saccatum</i> (rounded earthstar) <i>Agrocybe aegerita</i> (pioppino) <i>Grifola frondosa</i> (maitake) and <i>Piptoporus betulinus</i> (birch polypore), <i>Pholiota squarrosa</i> (<i>Shaggy scalycap</i>), <i>Daedalea quercina</i> .

Table-II: Various Edible Mushrooms and Their Medicinal Properties

Scientific Names	Common Name	Medicinal Function	Active Compounds
<i>Agaricus bisporus</i>	Portobello, white button, champignon, crimmi	Immune system stimulation in vivo, activity against various cancer cell lines in vitro	Ergothioneine
<i>Agaricus subrufescens</i> , <i>A. blazei</i> , <i>A. brasiliensis</i> ,		Anticancer activity	Blazeispirol A, LMPAB, ABM-FD, and ABPC.
<i>Agrocybe aegerita</i>		Anticancer and immunomodulatory activities	
<i>Auricularia auricula-iudae</i>	Jelly ear, kikurage	anticancer, hypoglycemic, anticoagulant and anticholesterol	
<i>Auricularia polytricha</i>	Cloud ear	Bioactive compounds	Bioactive compounds
<i>Boletus edulis</i>	(Porcini, cep, borovik, steinpilz, herrenpilz)	Inhibit several malignant cell lines and bind to a neoplastic cell specific T-antigen disaccharide	Lectin
<i>Coprinus</i>	(Shaggy mane, ink)	Inhibited an adenocarcinoma cell line	
<i>Dictyophora indusiata</i>	(Phallus indusiatus)	Antioxidant and potential inflammatory and antimicrobial activities	Dictyophorine A/B, dictyoquinazol B/C, ribonucleases, and tyrosinase
<i>Flammulina velutipes</i>	(Enokitake, winter mushroom)	Anticancer activity, and epidemiological studies, immunomodulator	FIP-five, immunomodulatory protein, ergothioneine
<i>Grifola frondosa</i>	(Maitake, hen of the woods)	In relation to cancer, diabetes, and immune function	Alpha glucosidase inhibitors, D-fraction, MD-fraction, SX-fraction, and
<i>Lentinula edodes</i>	(Shiitake, black forest mushroom)	As an adjuvant treatment, AHCC may have anticancer activity	Lentinan, AHCC and LEM
<i>Morchella esculenta</i>	(Morel)	Stimulated immune function	Galactomannan
<i>Phallus impudicus</i>	(Stinkhorn)	Anticancer activity in relation to venous thrombosis	

<i>Pholiota nameko</i>		Antiinflammatory, immunomodulatory, and hypolipidemic activities.	
<i>Pleurotus djamor</i>	(Pink oyster mushroom)	Immunomodulatory activities	
<i>Pleurotus eryngii</i>	(King oyster mushroom, eringi)	Immunomodulatory activities	
<i>Pleurotus ostreatus</i>	(Oyster mushroom, hiratake)	Lowers cholesterol levels, anticancer and immunomodulatory activities	Lovastatin and pleuran
<i>Sparassis crispa</i>	(Cauliflower mushroom)	Anticancer and immunomodulating activity in vivo	
<i>Tremella mesenterica</i>	(Golden jelly fungus)	Anticancer and immunomodulating activities	
<i>Tremella fuciformis</i>	(White jelly fungus)		
<i>Tricholoma matsutake</i>	(Matsutake)	Potentially bioactive	Alpha-glucan polysaccharides

Table-III: Various Extractable Mushrooms and Their Medicinal Properties

Scientific Name	Common Name	Medicinal Function	Active Compounds
<i>Antrodia camphorata</i>	(Zhang-zhī)	Hepatoprotective, antihypertensive, anti-hyperlipidemic, immuno-modulatory, anticancer, anti-inflammatory and antioxidant activities	
<i>Astraeus hyperometricus</i>	(Earthstar)	Immunomodulators with anticancer activity	
<i>Cordyceps</i> Sp. <i>Tolyptocladium inflatu</i> , <i>C. subsessilis</i> .		Immunosuppressant drug, from, an anamorph of fatigue and bronchitis	Cordycepin, Cordymin, and Cordyheptapeptide A/B,
<i>Cyathus stercoreus</i>	(Bird's nest)	Antioxidant	Polyketide antioxidative Cyathusals Cyathuscavin A/B/C,
<i>Ganoderma lucidum</i> , <i>G. tsugae</i>	(Mannentake, língzhī, reishi)	Millennia, anticancer, immunomodulating, blood platelet inhibitors hepatoprotective activities, ACE inhibitors, and antifibrotic activity, increased plasma antioxidant capacity and enhanced immune responses in advance-stage cancer patients	Ganoderic Acids

<i>Inonotus obliquus</i>	(Chaga), Befungin	Anticancer activity	Styrylpyrone compounds, melanin, and the betulinic acid precursor, betulin
<i>Phellinus linteus</i>	Meshimakobu , sang-hwang	Anticancer activity	Hispidin, hispol on, phellinins A1 /A2, phellinstati n, interfungins A, & styrylpyrone- class
<i>Schizophyllum commune</i>	Split gill	Anticancer activity	Polysaccharide
<i>Trametes versicolor</i>	Turkey tail, yun-zhī, kawaratake	immunostimulant and anticancer properties against gastric and colorectal cancers	PSK (Krestin), PSP, and VSP,