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A study of socio-economically significant variety of fleshy medicinal Mushroom of Chhattisgarh, India

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Abstract

India has a very high rich assemblage from since ancient time of traditional healing systems. Traditional aboriginals knew very much the medicinal importance of edible and wild mushrooms. In developing countries like India mushroom are boon for progress in the field of food, medicine, industries and unemployment. Mushroom in 20th century are well known to people, Mushrooms and toadstools belong to the kingdom fungi are highly nutritive, low-calorie food with good quality proteins, vitamins and minerals and an important source of medicines. Mushroom represents a big major and untapped source of potent new pharmaceutical products and industries. In developing countries like India mushroom progress is a boon in the field of food, medicine, vitamin, protein and in generating employment. The immense socio-cultural diversity and nutrition makes it an ideal storehouse of traditional medicinal knowledge. The only safe way to distinguish between edible and poisonous species is to learn to identify them accurately. The aim of the present study was brings into light the species diversity of agaric flora as well as socio-economic value as non edible, edible and mushroom medicines in different agro-climatic zones of Chhattisgarh India.

Key words : Mushroom, Species diversity, Agaric flora, Socio-economic, C.G.

Mushrooms have become attractive and famous as a functional food and as a source for the development of drugs and pharmaceuticals[25] responsible with their antioxidant, antitumor, anti-fungal and antimicrobial properties[21]. Except their pharmacological features, mushrooms are becoming more important and useful in our diet due to their

nutritional value, disease treatment, related to high protein and low fat[1]. Fungi use as medicine, food and fodder. There are so many different types of fungi are present in Chhattisgarh. Mushroom species cultivation is very popular in Chhattisgarh. Mushroom can provide us balancing diet compounds in sufficient quantities for human nutrition. Fungi can account for 25% or more of the root mass of forest, thus a major below-ground structural component of the forest ecosystem. We need to know about diversity of these fungi at a community or local level. Mushroom has provided us medicinal compounds for human scientific studies have confirmed that substances extracted from mushrooms can reduce blood pressure, blood cholesterol and blood sugar level as well as inhibition of platelet aggregation. Ganoderma species are famous tonic in Chinese medicines. They are widely distributed in India. The total number of edible and medicinal fungi is over 2300 species[31]. Cultivated different types of mushrooms have become popular, and over 200 genera of macro fungi are useful for the people in the world. Biochemical compositions of mushroom may be like meat and contain B complex, vitamins, minerals, and protein, and also special volatiles[32].

Medicinal mushrooms :

Medicinal mushroom are mushroom or extracts used or studied as possible treatments for disease. Bahl[4] reported that mushroom cure epilepsy, wounds, skin diseases, heart ailments, cholesterol reduction, stress, insomnia, asthma, allergies and diabetes, rheumatoid arthritis, cholera besides intermittent feves, diaphoretic, diarrhea, dysentery, cold, anesthesia, liver disease, gall bladder disease and used as vermicides. Some mushroom materials, including polysaccharides, glycoprotein's and proteoglycans, modulate immune system responses and inhibit tumor growth in preliminary research, whereas other isolates show potential cardiovascular, antiviral, antibacterial, anti-parasitic, anti-inflammatory anti-diabetic, antifungal, antitumor, hepatoprotective, hypolipedemic, antithrombotic, anticancer, psychotropic and hypotensive properties[59].

Some medicinal species of Mushrooms – 5 *spcies :*

1. *Ganoderma lucidum :*

Ganoderma lucidum is the most popular medicinal mushroom of the world. It is also known as Reishi. Traditionally it has been used widely in the treatment of hepatopathy, nephirits, bronchitis, chronic hepatitis, hypertention, arthritis, insomnia, asthma and gastric ulcer. It also has anti-tumor, cardiovascular respiratory and anti-hepatotoxic properties[56]. It is used to cure cardiovascular disease and contains several major constituents which may lower blood pressure as well as decrease LDC cholesterol. These constituents also help reduce blood platelets from sticking together-an important factor in lowering the risk for coronary artery disease. It has been used for a wide range of health benefits from preventive measures and maintenance of health to the management and treatment of chronic as well as acute human aliments[42]. It is also used by Indian tribals for treating joint pain[20].

2. *Morchella esculenta :*

Morchella esculenta is an edible morel

mushroom, locally known as Guchhi. It is used in medicine and health care system by the traditional societies and also used in clinically. Nitha *et al*.,[32] confirmed its antitumor activity against both ascites and solid tumors. It has antitumor, anti-oxidative, anti-inflammatory, antibacterial, antifungal activities. Negi[36] discussed the nutritional value and medicinal use of *Morchella* species.

3. *Coprinus comatus :*

This fungus is commonly known as shaggy ink cap, lawyer's wig or shaggy mane. Various bioactive functions have *Coprinus comatus*, such as hypoglycemic, consumption of *C. comats* can help regulate blood glucose concentration. It has immunomodulation, hypolipidemic, antitumor and antibacterial effects[5,17]. Antimicrobial activity of *C. comatus* was reported by Ershova *et al.*, (2001) and antioxidative properties were reported by Wei and van Griensven[60]. It has antioxidant properties also.

4. *Agaricus subrufescens :*

Agaricus subrufescens is a medicinal mushroom associated with Brazil and Japan. Research and small clinical studies demonstrated *Agaricus subrufescens* extracts have anti-hyperglycemic and anticancer activities[16]. Brefeldin A and blazein were isolated from Agaricus subrufescens. It has been documented as a traditional treatment for diabetes by Gray and Flat[18].

5. *Phallus indusiatus :*

Medicinal use of *Phallus indusiatus* was first noted during the Tang Dynasty. *Phallus indusiatus* extracts promote NFG-synthesis and have anti-inflammatory activity in vitro. *Phallus indusiatus* isolates include 5-(hydroxymethyl)-2-furfural, the antibiotic albaflavenone, dictyophorines, and dictyoquinazols.

Medicinal utillities of Mushroom :

Antimicrobial :

Antibiotics retapamulin, tiamulin, and valnemulin are derivatives of the mushroom isolate pleuromutilin. Plectasin, austrocortilutein, austrocrotirubin, coprinol, oudemansin A, strobilurin, illudin, pterulone, and sparasssol, are antibiotic isolate from mushrooms[43]. Qureshi *et al.*,[40] have studied that the antimicrobial activity of various solvent extracts (40µg/ml) of Ganoderma lucidum was tested against six pathogenic species of bacteria.

Anticancer :

Some countries have approved Beta-glucan mushroom extracts lentinan, polysaccharide-K, and polysaccharide peptide as immunologic adjuvants. There is some evidence of this use having effectiveness in prolonging and improving the quality of life for patients with certain cancers, although the Memorrial Sloan-Kettering Cancer Center observes that "Well designed, large scale studies are needed to establish the role of lentinan as a useful adjunct to cancer treatment". Screening of plant extracts for anticancer activity began[38] at NCI in 1956.

Anti-diabetic :

Many mushroom isolates act as DPP-4 inhibitors, alpha-glucosidase inhibitors, and alpha amylase inhibitors in vitro. Ternatin is a

mushroom isolate that suppresses hyperglycemia.

Nutrients and phytochemicals :

Only fungi and animals can synthesize vitamin D. Mushroom have been verified creating D_2 (ergocalciferol), D_4 (22-dihydroergocalciferol), and vitamin D_1 (Lumestrol+D_2). Mushroom are a rare source of ergothioneine, contain ACE inhibiter peptides, and a source of prebiotic dietary fiber. Mushroom also contain a variety of chemicals like lovastatin, cordycepin, inotilone, quercinol, antcin B, antrodioxolanone, and benzocamphorin F having preliminary research evidence for anti-inflammatory activity. Mushrooms are a rare source of ergothioneine. Mushroom also contain a variety of phytochemicals such as cordycepin, inotilone, quercinol, antcin B, antrodioxolanone, and benzocamphorin F having preliminary research evidence for anti-inflammatory activity.

Economic value :

Mushroom has many economic importances. It is used in medicine and also used in food. In food there are two types, some are edible and some are non edible.

Edible mushroom :

Edible mushroom are the fleshy and edible fruit bodies of several species of macrofungi (fungi which bear fruiting structures that are lato be seen with the nacked eye.) Edibility may be defined by criteria that include absence of poisonous effect on humans and desirable taste and aroma. Mushrooms are used extensively in cooking, in many cuisines (notably Chinese, Korean, European, Japanese and Indian). Mushroom is called Khumb in Hindi. They are known as the "meat" of the vegetable world[33]. Edible mushrooms are consumed by humans as comestibles for their nutritional value and they are occasionally consumed for their supposed medicinal value. Mushroom consumed by those practicing folk medicine are known as medicinal mushroom. Edible mushroom include many fungal species that are either harvested wild or cultivated.

Some edible species -

I. ***Agaricus bisporus-*** The most popular of these, *Agaricus bisporus*, is considered safe for most people to eat because it is grown in controlled, sterilized environments. Several varieties of *A. bisporus* are grown commercially, including whites, crimini, and Portobello[15].

II. ***Oyster Mushroom*** **–** Oyster mushroom derive their name from oyster, owing to the similarity in appearance. Oyster mushroom (Pleurotus species) is excellently edible and nutritious, rank among of the most widely cultivated mushroom in the world[11] Potent antioxidant compounds in oyster mushrooms have sent scientists researching their potential benefits for treating HIV disease. A part from this, thes

mushrooms is contenders for protecting against cancers and facilitating heal cholester levels in the body[42].

III. ***Auricularia auriacula*- Judae-** It is an edible mushroom. It is specially grow in Chhattisgarh in rainy season and it distribution is in Raipur. It is found on dead branches of mango, cluster apple, subabool, gulmohar. Auricularia auriacula-judae is known as the Jews car, wood ear, and jelly ear or by a number of other common species, is a species of edible Auriculariales fungus found worldwide. It has a soft, jelly-like texture. The nutritional content of 100g (3.5 oz) of dried fungus includes 370 kcal, 10.6g of protein, 0.2g of fat, 65g of carbohydrate, 5.8g ash, and 0.03%mg of carotene[54].

IV. ***Shiitake*-** The Shiitake (Lentinula edodes) is an edible mushroom native to East Asia, Which is cultivated and Consumed in many Asian countries. It is also considered a medicinal mushroom in some forms of traditional medicine[53].

V. ***Maitake*-** This is an edible mushroom**.** Appear rippling and fan- shaped, without caps. They are also called "Hen of the woods." This is a main dish ingredient, or used in side dishes and soups. The nutritional content of calories-26, carbohydrate (% dally value) 5.9 (2%). It dosage for adults-take 1 teaspoon two to three times a day in water or in juce[11].

Non-edible species (Poisonous) :

Non edible mushroom is wild or poisons mushroom. Mushroom poisoning (also known as mycetism) refers to harmful effect from ingestion of toxic substance present in a mushroom. Many mushroom species produce

secondary metabolites that may be toxic, poisonous, antibiotic, antiviral, antifungal or bioluminescent. Although there are only a small number of deadly species, several others can cause particularly severe and unpleasant symptoms[22]. Toxicity likely plays a role in protecting the functions of the basidiocarp: the mycelium has expended considerable energy and protoplasmic material to develop a structure to efficiently distribute its spores. Harmful effect of mushroom these symptoms can vary from slight gastrointestinal discomfort do death. The toxins present are secondary metabolites produced in specific biochemical pathway in the fungal cells. Mushroom poisoning is usually the result of ingestion of wild mushroom after misidentification of a toxic mushroom as an edible species. The most common reason for this misidentification is close resemblance in terms of color and general morphology of the toxic mushroom species with edible species.[6]

Poisonous species of mushrooms -

Some species of mushrooms are known as toxic because they are non edible and in some countries many cases of mushroom poisoning are identified and reported every year. A wide variety of toxic mushrooms belong to different genus that will be discussed bellow.

1. *Amanita*

The family Amanitaceae (genus Amanita) is well known as having many toxic species. Amatoxins are present in species of Amanita genus such as: Amantia phalloides, A. virosa, A. verna, A. ocreata, A. bisporigera. Toxins found in Amantia genus belong to the family of phallotoxin that includes phalloin, phalloidin, phallish, phallacidin, phallacin and phallisacin. Virotoxin is also found in the genus and are closed related the phallotoxins. The toxic effects are caused by phallotoxin and amatoxin[57].

2. *Psilocybe*

Psilocybe is an intoxicant mushroom. The symptoms of their intoxicant occur in 30 minutes after ingestion of fresh or dried mushroom and start with anxiety, nausea, vertigo and asthenia, neurosensorial symptoms consists of visual problems, disorientation, motor incoordination and sympathomimetic symptoms consist of mydriasis, tachycardia and hypertension. Recovery is completely 4 to 12 hours after ingestion[39].

3. *Cortinarius*

Cortinarius is a non edible mushroom and it has some intoxicants properties. C.

speciosissimus and C. orellanus are nephrotoxic due to the presence of the cyclopeptide orellanine whose metabolites are supposed to be most active. The symptoms of orellanine intoxication may appear between 2-20 days after ingestion. Initially people can experience nausea, vomiting and abdominal pain. This is followed by intense thirst, chills, polyuria or oliguria and possibly anuria.

Edible and Non-edible Mushroom of Chhattisgarh

S. no.	Mushroom Species	Habit and habitat	Season	Distribution	Type (edible/ non-edible)
1.	*Agrocybe erebia*	Sporophore in groups on ground	Rainy season	Bilaspur	Non-edible
2.	*Auricularia* spp.	On dead branches of mango, custard apple, subabool, gulmohar.	Rainy Season	Raipur	Edible
3.	*Coriolus*	On dead wood	Rainy season	Narayanpur	Medicinal or therapeutic Value
4.	*Hypoxylon fragifrome*	Normally gregarious on rooting beech, grow on weed, crust like stromata.	Rainy season	Gariabandh forest	Non-edible
5.	*Amanita* spp.	Sporophore occurs on the soil under shrubs	Rainy Season	Baster forest	Poisonous
6.	*Ganoderma lucidum*	Sporophores grows solitary	Rainy season	All forest area of Chhattisgarh	Non-edible
7.	*Ganoderma tsugae*	Sporophore grows solitary or in groups	Rainy season	Ambikapur, Baster and Bilaspur.	Non-edibla
8.	*Lentinus* spp.	Sporophore in bunches on dead wood log.	Rainy season	Korea	Edible
9.	*Marasmius oreades*	Sporophore gregarious in grass land.	Rainy season	Bastar forest	Edible
10.	*Russula mairei*	Under shrubs or mixed forest	Rainy season	Achanakmar, Barnawapara	Non-edible
11.	*Lepista nuda*	In humus rich ground under broad leaves shrubs	Rainy season	Achanakmar, Bilaspur	Edible
12.	*Phallorina* spp.	Sporophore solitary or in groups on soil under the trees	Rainy season	Guru Ghasidas University, Bilaspur.	Edible

Mushroom type botanical name and their local name

S.No.	Mushroom (Type)	Botanical name	Local name
1.	Medicinal	*Ganoderma lucidum*	Reishi
2.	Medicinal	*Morchella esculenta*	Guchhi
3.	Medicinal	*Coprinus cometus*	Shaggy mane
4.	Medicinal	*Agaricus subrufescens*	Sun mushroom
5.	Medicinal	*Phallus indusiates*	Bamboo fungus
6.	Medicinal	*Agaricus campestris*	Meadow mushroom
7.	Medicinal	*Hydnum repandum*	Wood hedgehog
8.	Medicinal	*Cantharellus cibarius*	Chanterelle

Diversity of fungal flora :

Fungi are cosmopolitan organism that colonize and remain in various natural environments that include from the ground to the oral human cavity. However, its distribution variety according to the various regions in the world, weather and local specific environment[34]. Some fungus can survive the intense uv and cosmic radiation encountered during space travel. It includes extreme environments such as desert or areas with high salt Concentration or ionizing radiation, as well as in deep sea sediments. The number of fungi were recorded in India exceeds 27,000 species, the largest biotic community after insects. The true fungi which are belong to kingdom Eukaryota which has four phyla, 103 orders, 484 families and 4979 genera. The numbers of fungal genera are reported from the world and that from India between 1905 and 1995.

The present study is an attempt to deal with the medicinal importance of edible and wild mushroom. Diversity of mushroom has a wide range in India. Mushroom has highly vitamin, protein, calories, nutrition and importance source of medicine. Mushroom found in many countries of India. It also found in many district in Chhattisgarh. Chhattisgarh has an immense for commercial and good enterprise for small formers and landless formers of mushroom cultivation by recycling paddy waste for higher income generation. It can cater the growing food demand, helps reduce economic viability. Mushroom cultivation has a high unemployment potential and it can solve reducing environmental pollution to a signification extent.

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