

A REVIEW OF TOXIC EFFECTS AND APHRODISIAC ACTION OF MORCHELLA ESCULENTA (WILD MOREL- GUCHHI MUSHROOM) - A HIMALAYAN DELIGHT**Dr. Vd. Sushant Sud*¹ and Vd. Khyati S. Sud²**¹Lecturer, Department of Agad Tantra, Shri Gulabkunverba Ayurved Mahavidyalaya, Jamnagar, GAU.²Reader, Department of Kayachikitsa, Dhanwantry Ayurved College, Koydam, Dist. Mahisagar, Gujarat.***Corresponding Author: Dr. Vd. Sushant Sud**

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Article Received on 19/06/2017

Article Revised on 11/07/2017

Article Accepted on 01/08/2017

ABSTRACT

Morchella, the true morel, is a genus of edible mushrooms closely related to anatomically simpler cup fungi. These distinctive mushrooms appear honeycomb-like in that the upper portion is composed of a network of ridges with pits between them. Morels, also known as sponge mushrooms, *Morchella Esculenta* (L) also known as Himalayan wild mushroom. They are some of the most desirable edible mushrooms known in the Himalayan regions. The taxonomy of morels is poorly known. Even the number of morel species is a matter of debate. Though *Morchella* as a genus is fairly easy to recognize, species differentiation within genus is markedly difficult, and a variable number of species are therefore recognized. India is one of the major producing countries of dry morels throughout the world and one among such morels is "*Morchella Esculenta*" (Guchi Mushroom) is said to be poisonous if eaten raw and produces so many adverse reactions if not used properly. This family of Mushroom is excellent and edible, it is very complex as more than twenty varieties of them are identified some do contain toxic substances which might cause fatigue, dizziness, difficult to breath and even ultimate death once mistakenly consumed. There is a reference of a drug named Chhatrak (kumbhi-guchhi) in the Sutrasthana of Charak Samhita, under the Chaturtha Shakvarga dravya which is taken to be as a variety of Mushroom. Hence proper evaluation of *Morchella esculenta* (Wild Morel- Guchhi Mushroom) would serve as an important tool for better understanding of both the drugs and its toxicity, so as to provide scientific data and statistical validation of its safety and efficacy. An attempt will be made with this project on "A Review of Toxic Effects and Aphrodisiac Action of *Morchella Esculenta* (Guchhi).

KEYWORDS: Guchhi, *Morchella Esculenta*, Toxic Effects and Aphrodisiac Action.**INTRODUCTION**

The use of plants and plant products as medicine can be traced as far back as the beginning of human civilization. The earliest record of medicinal plant use in the Himalayas is found in the Rigved. After the Rigved, Ayurved describes the medicinal importance of 1200 plants. The Charak or Charak Samhita (900 BC) and Susruta Samhita (500 BC) enumerate the art of surgery, therapeutics and medicines in detail on the basis of Atharvaved.^[1] Medicinal and aromatic plants are local heritage of global importance. Total 60 percent of the population of world and 80 percent of the population in developing countries rely on traditional medicine, mostly plant drugs, for their primary health care needs.^[2] Mushrooms are the higher fungi which have long been used for food and medicinal purposes. They have rich nutritional value with high protein content (up to 44.93%), vitamins, minerals, fibers, trace elements and low calories and lack cholesterol. There are 14,000 known species of mushrooms of which 2,000 are safe for human consumption and about 650 of these possess medicinal properties. Among the total known mushrooms, approximately 850 species are recorded

from India. Many of them have been used in food and folk medicine for thousands of years. The Himalayas, often called "The Roof of the World", encompass a number of biodiversity hot spots and repositories of medicinal plants. The whole Himalayan range is envisaged as a trove of medicinal herbs, offering refuge to a variety of rare plants in its varied mountain ecosystems. One among them is *Morchella esculenta* (L.) Pers. commonly known as Guchhi is nutritionally and medicinally important and most expensive fungus of morchellaceae family. It is commonly present as a mycorrhiza or saprobic relationship with hardwood and coniferous trees at an altitude of 2500-3500m, recorded from temperate regions, Asia, Himalayan Mountains, Europe, Mediterranean countries and in America. *Morchella esculenta* is well known throughout the world due to its nutritional aspects. It contains carbohydrates, proteins, fibres, all important vitamins, minerals and aromatic compounds.^[3,4]

Due to changing life, perception and lifestyle changes of the forest dwellers, the plants are exacerbated and that indigenous knowledge on resource use is being degraded

severely.^[5,6] Medicinal herbs are regarded as free commodity (zero private cost) to be collected from nature.^[7] So in this way such review studies are a suitable source of information regarding useful medicinal plants that can be protected by domestication and scientific management.^[8]

Ancient aspects of *M. esculenta* – Gucchi/Chatra/khumbhi

Ancient Romans regarded fungi as great delicacies and they distinguished a number of different types including the 'Boleti' (*Amanita caesare*), which were cooked in special vessel, the 'Boletari'. The ancient word in Sanskrit mentioned in Charak Samhita for mushroom appears to be 'Ksumpa'.^[9] The word 'Chatra' was used later to designate the capped mushroom. In ancient India, the Aryans, who invaded the land around 1500 B.C., brought with them the intoxicating drink, Soma. In the Rig Veda, there are many hymns on soma and one school of thought is that soma was extracted from the mushroom, *Amanita muscaria*, commonly known as the 'fly agaric'. Besides, this more like *Morchella esculenta* is having medicinal values in ancient Sanskrit works.^[10]

Table 1: Vernacular names of *Morchella esculenta*^[11]

Region/ Language	Vernacular Name
French	Morille
Germany	Speisemorchel
Italian	spugnola bruna
Spanish	Colmenilla
Nepal	Guchi chyal
India	Guchhi

Table 2: Systematic classification of *Morchella esculenta*^[11]

Kingdom	Fungi
Phylum	Ascomycota
Class	Discomycetes
Order	Pezizales
Family	Morchellaceae
Genus	<i>Morchella</i>
Species	<i>Morchella esculenta</i> (L.) Pers

Bio-Diversity of *Morchella esculenta*

Morchella esculenta (L.) Pers. ex Fr. (Guchhi) belongs to the family Helvellaceae. It is distributed around the world (Europe, Asia and North America) especially in the temperate regions.^[12]

Traditional use

It is a delicious food item with alleged aphrodisiac properties.^[12]

Chemical constituents (As mentioned in different cited articles in peer journals)

M. esculenta lipids had the following properties: acid no. 3.18, saponification no. 224.4 and iodine no. 107.2. The fatty acids obtained after saponification included linoleic 52.8%, oleic 23.6%, palmitic 14.1%, stearic 5.4% and

heptadecanoic 0.4% acids.^[12,13] A peptide, γ -L-glutamyl-cis-3-amino-L-proline, has been isolated from the cultured mycelium of *M. esculenta*.^[14] A comparative study of the chemical compounds of *M. esculenta* collected from Japan, Germany and France was done. In all these three samples, the amount of moisture, proteins and lipids were almost same but the Japanese sample contained lower amount of ash than the Germany and France samples. The main fatty acids in all three samples were C16:0 (13%), C18:1 (apprx. 10%) and C18:2 (approx. 60%). Among the sterols, ergosterol was approximately 35% in the Germany and France samples where as the Japanese sample had about 15%. Ergosta-5, 7-dienol (approx. 36%) was found in the Germany and France samples. 5'-GMP in the German sample was 5-fold more than in the Japanese sample.^[15] An amino acid called morchelline has been obtained from a culture broth of *M. esculenta*.^[16] Another amino acid, cis-3-amino-L-proline, was isolated from the growth medium containing mycelia of *M. esculenta*.^[17] Enzymes belonging to the class γ -glutamyltranspeptidases with the ability to perform hydrolysis and transpeptidation of various γ -glutamyl substrates have partially been purified from the cell-free extract of cultured mycelia of *M. esculenta*.^[18] Furthermore, fraction containing lipoygenase activity has partially been purified from an enzymatic extract from *M. esculenta*.^[19] Polysaccharides named as MEP-SP2 and MEP-SP3 have been obtained from *M. esculenta*. MEP-SP2 with molecular weight 7 of 23,000 contained four kinds of monosaccharides. These monosaccharides were mannose, glucose, arabinose, and galactose in the mole ratio 1.75:4.13:0.71:0.68. MEP-SP3 has molecular weight of 44,000 and it consisted of six kinds of monosaccharides. They are xylose, glucose, mannose, fructose, arabinose, and galactose in the mole ratio 3.58:14.9:3.85:1.77:51.3:0.53.^[20] From a polar extract of *M. esculenta*, a high molecular weight galactomannan polysaccharide was isolated. It consisted of about 2.0% of the dry fungal material weight and includes mannose (62.9%) and galactose (20.0%).^[21] A steroidal derivative, ergosterol peroxide, has been detected in *M. esculenta*.^[22]

Biological properties (As mentioned in different cited articles in peer journals)

M. esculenta extract was found to be active against *Escherichia coli*, *Bacillus mesentericus* and *Bacillus subtilis*.^[13,23] Polysaccharide from *M. esculenta* had strong antibacterial and anti-actinomycete powers.^[24] The methanol extract as well as ethanol extract of *M. esculenta* demonstrated high antioxidant properties.^[25,26] The galactomannan polysaccharide isolated from *M. esculenta* demonstrated immunostimulatory activity.^[27] The platelet aggregation inhibitor isolated from the fruiting body of *M. esculenta* has been patented.^[28] A patent has been issued to skin-lightening cosmetics containing melanin formation inhibitor extracted from cultured *M. esculenta*.^[29]

Table 3: Active constituents of *Morchella esculenta* and their pharmacological properties.^[30]

Active constituents	Pharma-cological properties	Reference
Phenolic compounds	Antioxidant, antimicrobial, anti-allergenic, anti-inflammatory and antitumor	(Helenoa <i>et al.</i> , 2013; Halliwell, 2012 and 2011)
Polysaccharides	Antioxidant, Aphrodisiac	(Meng <i>et al.</i> , 2010)
Galactom-annan	Immunostimulatory	(Duncan <i>et al.</i> , 2002)
Organic acids	Antioxidant, neuroprotective, anti-inflammatory and antimicrobial	(Helenoa <i>et al.</i> , 2013; Baati <i>et al.</i> , 2011)
Tocopherols	Strong antioxidant, Aphrodisiac	(Helenoa <i>et al.</i> , 2013)

Similar species

Morchella esculenta is probably the most popular of the morels. In contrast to *M. angusticeps* and its relatives, the caps are light-colored throughout development, especially the ridges, which remain paler than the pits. *M. crassipes* is sometimes confused with *M. esculenta*.^[31] According to Smith (1975), the two are distinct, but young forms of *M. crassipes* are difficult to separate from *M. esculenta*. The two are similar in color, but *M. crassipes* is larger, often has thin ridges, and sometimes has a stem base that is enlarged and longitudinally grooved.^[32] Morels have also been confused with stinkhorns, but specimens of the latter have a volva at the base of the stem, are covered with gleba-a slimy, foul-smelling spore mass.^[33]

Diversity of Nutraceutical and Therapeutic metabolite

Fruiting body of *Morchella esculenta* is edible. It is highly nutritious, delicious and healthy. It is rich in protein, carbohydrates, vitamins, particularly vitamin B and trace amount of vitamin C, D and A, also contains minerals and possesses low calories.^[34] *Morchella esculenta* contains 32.7% protein, 38% carbohydrates, 17.6% fibre, 9.7% ash and 2.0% fat.^[35] It also contains 1.82 mg/g magnesium, 0.85 mg/g calcium, 23.5 mg/g potassium, 0.18 mg/g sodium, 3.49 mg/g phosphorus, 195 mg/g iron, 98.9 mg/g zinc, 62.6 mg/g copper and 54.7 mg/g manganese.^[36] Previous studies also reported a variety of aromatic compounds including aldehydes, acids, ketones, esters and terpene. The major aromatic compound is phenol which is about 50.88%, alcohol is present about 15.55%, and ester and carbamic acid is present about 11.37%.^[37]

M. esculenta is rich in proteins which can be more easily digested than any other vegetables. In addition to such proteins that are necessary for general health *M. esculenta* is rich in B-complex vitamins and minerals. It has been discovered that *M. esculenta* is useful in the treatment of illnesses like cold, stomach/ headaches, and hepatitis B. It can reduce fatigue and sleeping problems as well as blood cholesterol levels. *M. esculenta* offers a good alternative for anaemia, a disease that arises from a deficiency in folic acid and it also helps to regulate the blood sugar level.^[38,39,40]

Toxicity Profile of *Morchella esculenta*

Mushrooms are also used in Traditional Medicines which may help to prevent heart diseases, diabetes, cancer and

obesity. There are about 7000 species of Mushrooms but a little over 100 species are suitable for human consumption. The rest are non edible or poisonous. Some of the edible morels if not properly used can cause benign neurologic effects. The effects usually starts after a latency of 6–12 hours and consisted primarily of ataxia and visual disturbances. The morel *Morchella esculenta* is well known and often collected as delicious, edible mushrooms but it shows toxicity only if it is eaten in large amount of freshly collected. One explanation may be that the assumed neurotoxin is volatile or unstable and the morels contain only small quantities. In the cases of intoxication, the mushrooms may have been cooked for too short a time to remove all of the poison and the morels were eaten in large amounts.^[41,42]

DISCUSSION

Fungi are basically plants devoid of green colouring substance called chlorophyll. Now this conception is slightly changed and Fungi are now categorized as a separate kingdom like plants and animals. They are considered to be the most important organisms on earth. Mycology is the study of Fungi. Edible mushrooms like *M. esculenta* and *M. conica* etc are consumed by humans for their nutritional values. Their medicinal research has indicated possible cardiovascular, anticancer, antiviral, antibacterial, antiparasitic, anti-inflammatory, hepatoprotective, and antidiabetic activities. Polysaccharides- protein complexes from medicinal mushrooms may enhance innate immune responses, resulting in antitumor activities in animals and humans. *M. esculenta* extracts have shown potential in vitro, to increase the level of Estrogen and Testosterone hormones production by prohibiting the enzymes aromatase and 5-alpha reductase.

India with diverse habitats with varied ecological conditions, harbors wide varieties of mushrooms potentially rich with nutritional and medicinal values. *M. esculenta* is known to be the source of various bioactive substances like antibacterial, antifungal, antiviral, antiparasitic, anti-oxidant, antiinflammatory, antiproliferative, anticancer, antitumour, aphrodisiac, cytotoxic, anti-HIV, hypocholesterolemic, anti-diabetic, anticoagulant, hepatoprotective. This particular variety of morels is in use as ethno medicines by many of the tribal communities for treatment of various diseases. Many mushrooms still remain unreported and their nutritional as well as health benefits are unknown to us. If discovered, some of them may have high nutritional

value and serve as valuable sources of bioactive compounds.

CONCLUSION

Fungi such as yeasts and molds are the sources of foods; preparation of wines, breads, cheese and antibiotics. Poisonous Fungi can cause humans, animals and plants diseases such as Candidiasis, Cryptococcosis and Histoplasmosis etc. Yeasts also present a common flora of human body like throat and vagina. The edible mushrooms are the best sources of proteins, vitamins and important minerals for human beings. They develop Immunity, cures anemia, avoids obesity, hypertension and arteriosclerosis. Mushrooms are preferred over other sources of proteins in special circumstances where there is a problem of uric acid. Mushrooms can be grown in a small limited place and its cultivation should be encouraged, but care should be taken by commoners to avoid collection and use of poisonous and non edible mushroom.

Morchella esculenta is an important fungus worldwide. It contains a wide range of active constituents which include tocopherols, carotenoids, organic acids, polysaccharides and phenolic compounds which exhibit a wide range of medicinal and pharmacological properties including anti-microbial, anti-inflammatory, immunostimulatory, antitumor and antioxidant. It is also used for the treatment of indigestion, excessive phlegm and asthma. Nutritionally, it contains carbohydrates, proteins, fibres, all important vitamins, minerals and aromatic compounds including aldehydes, acids, ketones, esters and terpene. Due to its delightful taste it is used in different recipes by the local people and different recipes are prepared by using this fungus in many three star and five star hotels. This fungus is very expensive, hence called “growing gold of mountains” and it contributes a major role in country’s economy. Therefore, extensive efforts should be made to cultivate this unique and valuable fungus on large scale in order to get health, medicinal benefits and foreign exchange.

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