



Ethnobotanical, Medicinal and Economic Importance of *Morchella esculenta*

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ABSTRACT

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. Due to its unique flavour, taste and texture it is used in different recipes all over the world. It possesses a wide range of pharmacological properties including antioxidant, antitumor, antimicrobial and anti-inflammatory, also act as an immunostimulant due to the presence of various active constituents. Ethnobotanically it is used as laxative, purgative, emollient, body tonic, also used for stomach problems, heal the wound and for general weakness. It is used as a fodder and for basket making. Due to its high price it plays a very important role in the economy of country. This paper gives an overview of scientific literature available on *Morchella esculenta* (L.) Pers. *Geographical indication (GI) tag for Doda region's 'Guchhi', a wild mushroom grown naturally in the foothills of the Himalayas, the government of Jammu and Kashmir plans to promote the species of fungus.*

Keyword's:- *Morchella esculenta*, mushroom Geographical indication(GI), conifers tree, nutritional value, ethnobotanical, economic .

Introduction

It is estimated that there are around 140,000 species of mushroom on earth, but so far only 10% (about 14,000) have been named and this number is increasing steadily. Mushroom, suitable humidity and temperature, under the forest, meadows, organic matter rich in soils, decaying branches and tree fragments are grown on. Mushrooms are prominent in the habitats they spread with the fructification organ in remarkable colors and shapes. Mushrooms have been used as nutrients by many communities due to their taste and nutritional content. The ancient Romans called "the food of the

gods” and the first Egyptians called the “gifts from God of Osiris” and Chinese called it “the elixir of life”. In the history of humanity, mushrooms have been consumed as food, especially during the rainy season. Approximately 1000 species of mushrooms are classified as edible worldwide. Mushrooms are known as healthy foods throughout the world with proteins, vitamins, minerals, chitin, essential amino acids as well as low fat and calories. The nutritional value of mushroom is comparable to foodstuffs such as corn, soybeans or beans. In addition to protein, dietary fibers, minerals such as potassium, phosphorus iron, and vitamins and carbohydrates. In a study on an edible mushroom species, it was found that 88-90% water, 3-8% protein, 0-3% fat, 4-9% carbohydrate, 1-2% ash (calcium, phosphorus, iron, copper, chlorine, sodium, zinc, manganese and bromine) in trace amounts; B vitamins A and B complex vitamins B1 (Thiamin), B2 (Riboflavin), B3 (pantetonic acid), B5 (Nicotinic acid), vitamins.5 Mushrooms are also rich in vitamin C and vitamin D. Mushroom contain 5-10 times more vitamin B3 than vegetables. The amount of fat is low in protein. It is also a food ingredient recommended for those who do not eat cholesterol because the fat content of mushroom is low. The richness of vitamins is known to have a calming and softening effect on the nervous system of humans. Nowadays, cardiovascular diseases, cancer and chronic diseases that can be caused by aging are gradually increasing. One of the main causes of this increase is thought to be oxidative stress. Antioxidant compounds function as protection mechanisms against damage that may occur in cell systems in living organisms, reduction of oxidative damage and damage. Mushrooms are quite good natural sources for these antioxidant compounds. Mushroom contains several secondary metabolites, including phenolic compounds, polyketides, terpenes and steroids in their structure. These secondary metabolites, which do not have nutritional values, are distinguished by their medical properties. These secondary metabolites play a vital role in the antioxidant defense mechanisms of biological systems. Previous studies have reported that fungi have antimicrobial, antibacterial, anti-carcinogenic, antioxidant, antiviral, anti-inflammatory, anticoagulant, cytotoxic, cytostatic, antiatherogenic, antioxidant, anti-allergic, hypoglycemic and immunosuppressive properties. As a result, mushrooms have been used and used by people

for different purposes for centuries. The nutritional characteristics of mushroom, their medical properties and their use in alternative fields will help people to search for natural resource.



Active constituents of *Morchella esculenta*

Fruiting body of *Morchella esculenta* possesses a wide range of active constituents which include tocopherols, carotenoids, organic acids and phenolic compounds. Tocopherols consist of α -tocopherol γ -tocopherol and δ - tocopherol. Carotenoids contain β -carotene and Lycopene. Organic acids contain oxalic acid, malic acid, citric acid, fumaric acid and quinic acid. Protocatechuic acid, p-Hydroxybenzoic acid and p-Coumaric acid are phenolic compounds.

Table 1:- Vernacular names of *Morchella esculenta*

Region	Vernacular name	Reference
India	Guchhi	Paliwal et al., 2013
French	Morille	Roody,2003
Spanish	Colmenilla	-
Italian	Spugnola	-

Systematic classification of *Morchella esculenta* (Litchfeld et al., 2006)

Kingdom :-Fungi

Phylum:- Ascomycota

Class :-Discomycetes

Order:- Pezizales

Family:- Morchellaceae

Genus:- *Morchella*

Species:- *Morchella esculenta* (L.) Pe

Table 2:- Active constituents of *Morchella esculenta* and their pharmacological properties

Active constituents	Pharmacological properties	Reference
Polysaccharides	Antioxidant	Meng et al.,(2010)
Organic acids	Antioxidant, neuroprotective, anti-inflammatory and antimicrobial	(Helenoa et al., 2013; Baati et al., 2011)
Phenolic compound	Antioxidant, antimicrobial, anti-allergenic, anti-inflammatory and antitumor	(Helenoa et al., 2013; Halliwell, 2012 and 2011)
Tocopherols	Strong antioxidant	(Helenoa et al., 2013)
Galactomannan	Immunostimulatory	(Duncan et al.,2002)

Nutritional importance

Fruiting body of *Morchella esculenta* are 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 (Negi, 2006; Mattila et al., 2001). *Morchella esculenta* contains 32.7% protein, 38% carbohydrates, 17.6% fibre, 9.7% ash and 2.0% fat (Wahid et al., 1988). 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

(Gençcelep et al., 2009). 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% (Taskeen, 2013). Due to its unique flavour and taste local people cook the fruiting body mixed with rice and vegetable and consider it as nutritious as fish or meat. Different recipes of Morchella are prepared in three star and five star hotels. Mostly used as a flavouring in soup (Prasad et al., 2002), used as a salad and side dishes. The most common method is to cook the morchella with butter (Robinson, 2011). Morchella are taken after meal as cooked with desi ghee (Khan et al., 2010)

Different recipes of Morchella esculanta

Plant part	Use	Reference
Fruiting body	Cooked with vegetable and rice and Taken in the form of soup	(prashad al.,2002)
Whole plant	Used in salad Cooked with butter Cooked with desi ghee Fried with onion, tomato and garlic Used in pizza	(Prasad et al., 2002) (Robinson, 2011) (Khan et al., 2010) (Fayaz et al., 2012).

Ethnobotanical uses of Morchella esculenta:-

Plant Use	Disease	Use and mode of utilization	References
Fruiting body	Hallucinogenic and immunoregulatory	Fried with cow's ghee and taken after meal	(Christine et al., 2002; Nitha and Janardhanan, 2008)
Whole plant	Intestinal and for gastric problem		(Ali et al., 2011)
Whole plant	General body tonic		
Fruiting body	Arthritis and general weakness		(Wagay and Vyas, 2011).
Fruiting body	For decoration purpose	After boiled in water or milk	Nautiyal et al., 2001
Whole plant	stomach-ache	Powder	Mehmood et al., 2011
Whole plant	purgative and used as an emollient		
Whole plant	Stomach problems and also heal the wound	Powder form	Nautiyal et al., 2001

Harvesting and collection of mushroom

Collection of *Morchella esculenta* is difficult work as it requires attention and passion. It is collected during spring and early summer by the local people and sold in the local market. It is collected after the ascocarp attains the size of 6.5-8 cm in height and 4.4-7.5 cm in diameter. Whole family becomes fully engaged and spend about 12 hours every day in collection. Ninety percent of its collection in Jammu and Kashmir particularly District Doda takes place from the Middle Himalayan mountain ranges. Many three stars and five stars hotels make different recipes by using *Marcella*, they purchase from traders. Many pharmaceutical companies also purchase it for making different medicines (Prasad et al., 2002).

Drying, storage and marketing process

The main problem of commercialisation of *Morchella esculenta* is its moisture content which reduces its shelf life. To avoid this problem it is properly dried and stored by the local people. For drying purpose first of all, mud is removed from the plant body and hanged for 10-15 days indoor or 2-3 days in sun (Garcia-Pascual et al., 2006). The best storage technique of morel is to keep them drying with a little ventilation. They are kept in closed chamber. Collectors sell the *Morchella* to the local grocers. They sell it to the middleman. Middleman supply morels to the main trading centre of big cities. From here, plants are mostly exported to the France, Belgium, Switzerland, Austria, Germany and Middle East.

Production:

Total world production of morels is 150 tonnes dry weight which is about 1.5 million tonnes of fresh weight. Major morel producing countries are India (Himalayan states viz Jammu and Kashmir, Himachal Pradesh) Pakistan each produces about 50 tonnes of dry morels, from which most commonly found is *Morchella esculenta* (FAO, 2002). The quantity of *Morchella esculenta* collected from KPK in 1995 was 55 tonnes, in 2000 it was about 65 tonnes and in 2005 it was about 70 tonnes (FAO, 2010).

Ethnobotanical knowledge

Local people think that a person who found *Morchella* is a very fortunate or luckiest person (Hamayun et al., 2003). It is believed that morels are mostly found under the trees of *Juglans regia*, *Quercus*, grasses, *Pinus wallichiana*. Local people consider the plant body as a hallucinogenic and immunoregulatory (Christine et al., 2002); it is eaten for intestinal and for gastric problem (Gilani et al., 2003). Whole plant is used as a tonic, laxative and immunostimulant (Ahmad et al., 2006). It is considered as a general body tonic if it is fried with cow's ghee and taken after meal. Moreover, it is laxative, purgative, emollient and used as a fodder, thatching and basket making by the local people of Swat. (Ali et al., 2011). Local people of Jammu and Kashmir use it for the treatment of chronic arthritis and general weakness (Wagay and Vyas, 2011). According to Ajmal et al. (2012). Whole plant is used as a general body tonic and used for the treatment of aphrodisiac. It is used in the form of powder for stomach problems and also heal the wound. Whole plant is cooked as vegetable and used in pizza.

Economic prospects

Morchella esculenta is the most important and precious fungal plant which plays an important role in the economy of Jammu and Kashmir. Price depends on the quality (Hamayun et al., 2006). The price is varied in early, middle and end of the season. The price of dry morels ranges from 4000 – 20000 per kg which makes it the most expensive fungus of the world. Collectors sell the fungus to the whole sellers through a middle man and earn about Rs. 8000 to 10000 per kg. Middle man sell them in a price of 12,000 to 14,000 per kg to the whole sellers. The whole sale price is reached at 15,000 per kg. Its price in national market is 20,000 per kg and international market it is about 30000 per kg. (2023).

CONCLUSION

Morchella esculenta is an important fungus worldwide. The forested areas of J&K are rich in mushroom species. 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 terpenes.

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. It mainly belongs to family Morchella with lot of medicinal value and properties.

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