



Morchella esculenta – An overview of it's Therapeutic Properties

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Abstract

Mushrooms, especially *Morchella esculenta* (known as morels), have been valued for their medicinal qualities and are frequently utilized in traditional healing practices in places like China and Japan. These fungi thrive in a variety of habitats but tend to flourish in regions that have experienced fire, noted for their nutritional and therapeutic value. In India, particularly in Himachal Pradesh and Jammu and Kashmir, indigenous cultures employ morels for various health-related purposes.

Morchella esculenta is characterized by a cylindrical shape with a prominent upper part (pileus) and a hollow stalk (stipe). Recent studies emphasize its wide-ranging biological functions, including antioxidant, anti-inflammatory, and immunomodulatory activity, which has led to an increasing demand in the market.

In terms of classification, *Morchella esculenta* falls under the Morchellaceae family within the kingdom of Fungi. It is rich in vital nutrients such as proteins, carbohydrates, and vitamins and is also praised for its culinary uses. Active compounds like polysaccharides and tocopherols show potential health advantages, including antimicrobial and anti-tumor effects.

Historically, morels have been employed to address a variety of health issues, making them a significant asset in traditional medicine. The extensive pharmacological properties and culinary desirability of *Morchella esculenta* highlight its significance, prompting calls for large-scale farming to leverage its economic and health advantages.

Keywords: Anti-oxidant, Nutrients, Health advantages.

Introduction

It has long been recognized that mushrooms offer therapeutic qualities (2). In China and Japan, they have long been utilized for a wide range of medical uses (2). Numerous physiologically active substances found in mushrooms provide health advantages and defense against a variety of degenerative disorders (2).

Common names for *Morchella esculenta* include yellow morel, real morel, common morel, and sponge morel (1). Some of the most expensive mushrooms in the world are those in the genus *Morchella* (2). The Morchellaceae family's highly significant morel mushroom can be found in a variety of settings, such as roadside ditches, excavation sites, mildly burned grasslands, and marshy places. It is typically found in areas that have been devastated by fire (1).

In India, certain *Morchella* species—"gucchi" locally—can be found growing in the Himachal Pradesh and Jammu and Kashmir woods (2). The state's latitude and longitude are 32°-17" and 37°-5" North and 73°-26" and 80°-30" East, respectively. Its average height above mean sea level ranges from 300 to 7200 meters, and its average rainfall is 150 cm (3). Between January and June, the minimum and maximum temperatures range from -5°C to 28°C (3). Owing to favorable environmental factors, the area has a wide variety of mushrooms, especially several *Morchella* species (3). In certain regions of India, indigenous hill cultures have been known to employ morel concoctions for medical and therapeutic purposes (2).

The structure of *Morchella esculenta* is cylindrical (1). The pileus, or upper section, accounts for 70–80% of the plant's weight (1). Round or uneven pits called pileus are observed, measuring 3–9 cm in length and 2–5 cm in width (1). It displays light, yellow, black, or brown hues (1). The lower portion referred to as the stalk

or stipe, makes up 20–30% of the plant's weight (1). With a length of 1.0 to 4.0 cm and a thickness of 0.5 to 3.0 cm, it is hollow (1). When fully grown, it changes from being whitish to pale gray to greyish brown (1). Stipes support the upper portion and have a small enlargement at the base (1). Its dimensions range from 2 to 25 cm when fresh, but it shrinks to 0.1 to 10 cm when it dries (1).

Contemporary pharmaceutical research (4) has shown numerous biological activities of *Morchella esculenta* mushrooms, including antioxidant, anti-inflammatory, anti-tumor, immunoregulatory, nephroprotective, anti-hyperlipidemic, and anti-atherosclerosis properties. Due to the many health benefits of morels, there is a greater demand for *Morchella esculenta* on the market (4).

Taxonomy of *Morchella Esculenta*

The biological classification of *Morchella esculenta* is highlighted in Table 1.1 (1,8).

Synonym	<i>Morchella rotunda</i> (Fr.), <i>Helvella esculenta</i> (L.) Sowerby, <i>Phallus esculentus</i> L
Common names	Common morel, yellow morel, sponge mushroom, true morel
Local names	Gucchi or Batta guech or khazer kann guech
Kingdom	Fungi
Phylum	Ascomycota
Class	Discomycetes
Order	Pezizales
Family	Morchellaceae
Genus	<i>Morchella</i>
Species	<i>Morchella esculenta</i> (L.) Pers



Table 1.1 – Taxonomy of *Morchella esculenta*

Fig - *Morchella esculenta*

Characteristics

Pileus - The color ranges from pale brown to grayish-brown, with an oval shape that is seldom sharply cone-shaped, typically having a rounded top or a more elongated form. Its width measures 2-7 cm, and its height ranges from 2-10 cm (8).

Stipe - Empty, erect, bulbous base, white to pale yellow. Typically 2–9 cm in length and 2-3 cm in width (8).

Flesh - Brittle or delicate (8).

Ascospores - Ellipsoidal, transparent, and smooth, with dimensions of around 16.5-21.0 × 8.0-11.0 μm (8).

Asci - Transparent, cylinder-shaped, eight-spored (8).

Paraphyses - Transparent, filamentous, and cylinder-shaped asci (8).

Season - Early spring (8).

Ethanobotanical knowledge

The locals believe that the person who discovered *Morchella* is the luckiest or most fortunate. Morels are mainly found beneath *Pinus wallichiana* and *Juglans regia* trees (1).

Uses	Mode of use
Body tonic	Consumed after a meal and fried with cow ghee
Wound healing and stomach issues	Used in powdered form
Culinary use in pizza	Prepared as vegetables

Table 1.2 – Uses of *Morchella esculenta*

Nutritional Importance

Morchella esculenta, also known as morels, produces edible fruiting bodies that are both flavorful and nutritious(1). They are low in calories while being high in protein, carbohydrates, and vitamins, particularly vitamin B (7). Morels also contain trace amounts of vitamins C, D, and A (7). In culinary applications, morels are commonly used as a nutritional supplement, and many products, including health drinks featuring *Morchella* as a primary ingredient, have been developed in recent years (7).

Research has identified numerous aromatic compounds in morels, such as aldehydes, ketones, esters, acids, and terpenes (1). Locals often cook the fruiting bodies with rice and vegetables, appreciating their distinct flavor and viewing them as equally nutrient-dense as meat or fish(1). Additionally, morels can be processed as a standalone product or combined with other food items to create innovative new offerings, leveraging the beneficial properties of two or more ingredients working together(7).

Active constituents

All of the essential nutrients found in *Morchella esculenta* are present, including proteins, carbohydrates, polyunsaturated fatty acids, and several bioactive substances with potential uses in anti-oxidant, anti-cancer, and anti-inflammatory applications, such as polysaccharides, organic acids, and polyphenolic compounds and tocopherols (6). The fruiting body of *Morchella esculenta* is rich in active ingredients, such as organic acid, carotenoids, phenolic compounds, and tocopherols (1).

α -tocopherol, γ -tocopherol, and δ -tocopherol are types of tocopherols(1). β -carotene and lycopene are components of carotenoids(1). Examples of organic acids include quinic acid, citric acid, faradic acid, malic acid, and oxalic acid(1). Phenolic substances consist of protocatechuic acid, p-hydroxybenzoic acid, and p-coumaric acid(1). In traditional hill societies, the diverse range of biomolecules found in *Morchella esculenta*, which possess nutritional and bioactive properties, is utilized for health care purposes(1).

Long chains of monosaccharides connected by glycosidic linkages form polysaccharides(4). These polysaccharides are well-known for their health benefits(4). As the primary bioactive components of *Morchella esculenta*, they have gained attention for their remarkable pharmacological properties, which include immunomodulatory, anti-inflammatory, antioxidant, and anti-atherogenic effects(4).

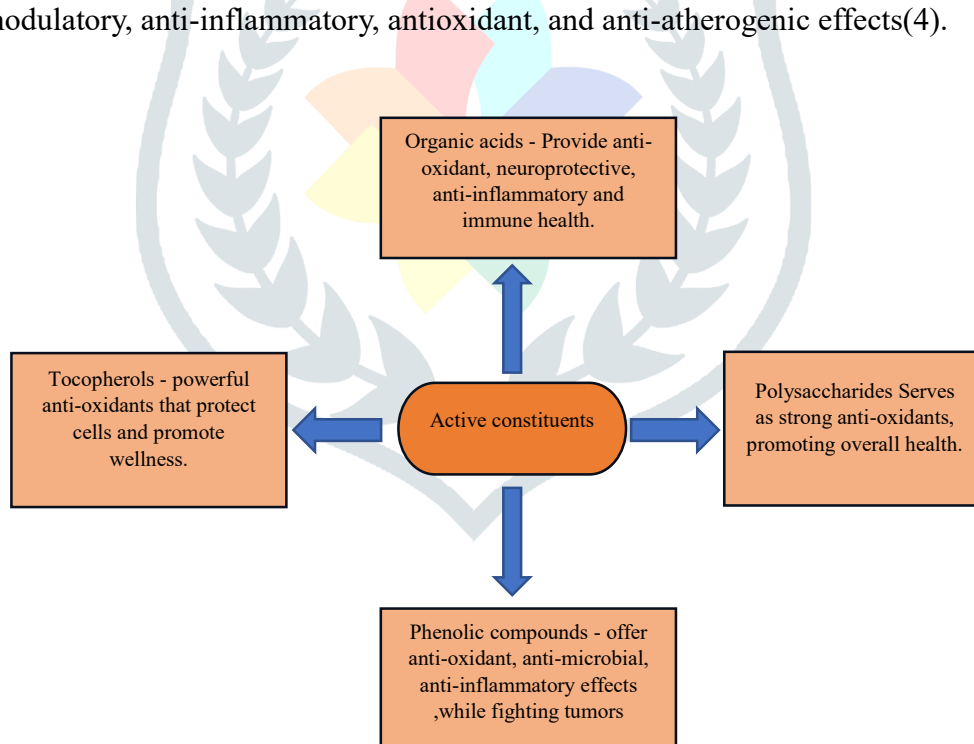


Fig – Active constituents of *Morchella esculenta*

Pharmacological prospects

Morchella species, commonly known as morels, have been traditionally used in various cultures for their medicinal properties(1). In Malaysia, Japan, and China, as well as among hill societies, *Morchella* is valued for its nutritional and bioactive compounds(1). Historically, they have been used to treat a range of conditions such as asthma, indigestion, and excessive phlegm(1). In particular, *Morchella esculenta* powder is noted for its role in alleviating stomachaches and serving as an antiseptic for wound healing(1). It also possesses emollient and purgative properties, making it versatile in traditional medicine(1).

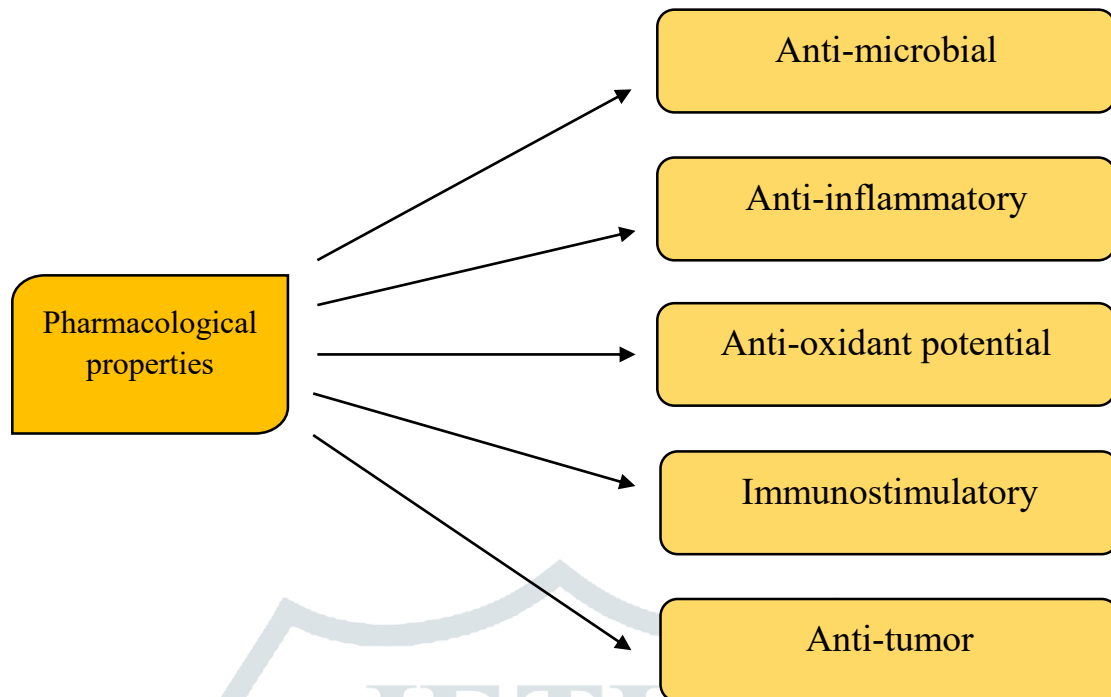


Fig - Pharmacological properties of *morchella esculenta*

Anti-microbial properties

Morchella esculenta mycelium displays remarkable antimicrobial characteristics (1). Studies have shown that its extracts—particularly those using methanol, chloroform, and ethanol—exhibit significant antibacterial properties (1). The mushroom effectively combats various pathogens, such as *Salmonella typhimurium*, *Escherichia coli*, *Listeria monocytogenes*, *Enterobacter cloacae*, and *Staphylococcus aureus* (1). This indicates that *Morchella esculenta* could serve as a valuable source in the creation of natural antibacterial agents (1).

Anti-inflammatory properties

Inflammation can arise from several causes, including insect bites, harmful medications, and chronic health conditions (1). *Morchella esculenta* comprises numerous compounds with substantial anti-inflammatory effects (1). Research has revealed that the methanolic extract of the entire mushroom noticeably reduces inflammation and relieves pain (1). Additionally, the ethanolic extract from cultured *Morchella esculenta* mycelium effectively curtails both acute and chronic inflammatory reactions (1). This highlights the potential of *Morchella esculenta* as a natural treatment for inflammatory ailments (1).

Anti-oxidant potential

Oxygen is essential for living organisms, yet oxygen-related free radicals can cause oxidative harm, which includes tissue injury and cell death (1). Such radicals can also contribute to various diseases, such as cancer, diabetes, and atherosclerosis (1). Consuming foods rich in antioxidants may help avert oxidative damage (1). In this regard, a range of plants can be utilized, but mushrooms are particularly important (1). Previous studies have highlighted the antioxidant capabilities of mushrooms, especially *Morchella esculenta* (1). Various active compounds present in *Morchella esculenta* demonstrate strong antioxidant properties (1). The beta-carotene and linoleic acid found in *Morchella esculenta* mycelium possess antioxidant attributes (1). *Morchella* is rich in phenolic compounds and fatty acids, which exhibit potent antioxidant and free radical scavenging capabilities (1).

Immunostimulatory properties

Galactomannan and polysaccharides obtained from the fruiting body of *Morchella esculenta* show increased molecular weight along with robust antioxidant properties (1). These elements significantly contribute to enhancing the health benefits of the mushroom, especially relating to their immunomodulatory and antioxidant effects (1). The presence of these bioactive polysaccharides underscores the potential of *Morchella esculenta* as a significant source of natural antioxidants, promoting overall health and wellness (1).

Anti-tumor properties

Cancer continues to be a major cause of mortality globally, and standard treatments like chemotherapy and radiation often impose considerable side effects on healthy cells (1). In traditional Chinese medicine, certain medicinal mushrooms, including *Morchella esculenta*, have been acknowledged for their potential anti-cancer effects (1). Studies suggest that polysaccharides derived from the fruiting body of *Morchella esculenta* possess strong anti-tumor properties, indicating that this mushroom could serve as a beneficial adjunct in cancer management (1). Its ability to boost treatment effectiveness while reducing side effects positions *Morchella esculenta* as a promising candidate for further research in the field of oncology (1).

Conclusion

Morchella esculenta, with its rich history in traditional medicine and culinary applications, demonstrates significant therapeutic potential. Its unique structure and composition contribute to various health benefits, including antioxidant, anti-inflammatory, antimicrobial, and anti-tumor properties. The active compounds found in morels, such as polysaccharides, phenolic compounds, and tocopherols, underline their importance as both a nutritious food source and a valuable medicinal resource. Increasing awareness and research into *Morchella esculenta* can promote its utilization, benefiting health and economic sectors. As demand grows, sustainable harvesting and cultivation practices will be crucial to preserving this remarkable fungus and its benefits for future generations.

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