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Review Paper

Nutritional Potentiality and Health Assets of Paddy Straw Mushroom – *Volvariella Volvacea*

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Abstract

In the traditional applications of fungi in far eastern medicine, medicinal mycology has strong and deep roots. As more individuals look for cures and health approaches free from negative effects brought on by industrial medicines, from being used seldom, medicinal mushrooms are becoming more widely used. Three hundred of the approximately 38000 distinct species of mushrooms are edible, and pharmacological studies are being conducted to explore the possible health advantages. The goal of this paper is to give a thorough overview of Volvariella volvacea's culinary and therapeutic uses. A member of the Pluteaceae family, Volvariella volvacea is a common edible fungus that grows in temperate, tropical, and subtropical climates in both the eastern and western hemispheres. It has anti-tumor, immunosuppressive, and immunomodulatory actions and is commonly utilized in India's traditional medical system. It is widely recognized as a good source of Protein, Fibre (Chitin) Vitamins (including a significant amount of Vitamin C and all water soluble vitamins like Riboflavin, Biotin and Thiamine), Fats (5.7%), Carbohydrates (56.18%), unsaturated fatty acids and minerals such as Potassium, Sodium and Phosphorus. V. volvaceais a remarkable medicinal fungus, as evidenced by the myriad therapeutic benefits it possesses and by phytochemical studies.

Keywords: Mycology, *Volvariella volvacea*, Pluteaceae, temperate, tropical, subtropical, anti-tumor, immunosuppressive, and immunomodulatory.

Introduction

In general, mushrooms refer to the fleshy fungus of the classes Ascomycetes and Basidiomycetes. The fruiting body of a fungus is a fleshy structure that bears spores and is usually found above ground, growing on soil or other substrate, is what is known as a mushroom or toadstool. Mushrooms come in a wide range of colors, sizes, and shapes. A mushroom is described as "a macro fungus with a distinctive fruiting body, large enough to be seen with the naked eye and to be picked up by hand"[1].

Thirty of the 38000 species of mushroom have been domesticated, and only 10 are grown for commercial purposes, of these 300 are edible. 61.16 million mushrooms are grown worldwide each year[2]. In Pennsylvania, Kennett Square, -the "mushroom capital of the world"—where mushroom farming first began in America in 1896, the first harvest of mushrooms was made. This region produces over half of the country's button mushrooms. The second and third largest growers of mushrooms are in California and Florida.

There are edible and toxic varieties of mushrooms. The four most often grown mushrooms are oyster (*Pleurotus ostreatus*), enoki (*Flammulina velutipes*), shitake (*Agaricus bisporus*), and *lentinula edodes*. Since ancient times, mushrooms have been extensively employed for a variety of reasons, including food and flavoring, medicine, and practical items. The nutritional value of edible mushrooms is comparable to that of eggs, milk, and meat[3].

It has no cholesterol content, high fiber value, vitamins, and minerals, is easily digestible, and includes high-quality proteins[4]. They have the capacity to keep the level of blood cholesterol optimal. Since ancient times, they have been utilized in traditional medicine all across the world. In various regions of the world, efforts have been made to investigate the potential benefits of using mushrooms and their metabolites to cure a range of people's illnesses. The therapeutic ability of macrofungi is tremendous yet mostly unrealized. It has the potential to develop into a prosperous biotechnology sector for the benefit of humanity.

The *Volvariella volvacea*, one of many tropical mushroom that is edible, is a well-liked component in recipes from numerous different nations. The molecular examination of the fruiting bodies of these mushrooms shows that *Volvariella volvacea* is also crucial for treating several human ailments[5].

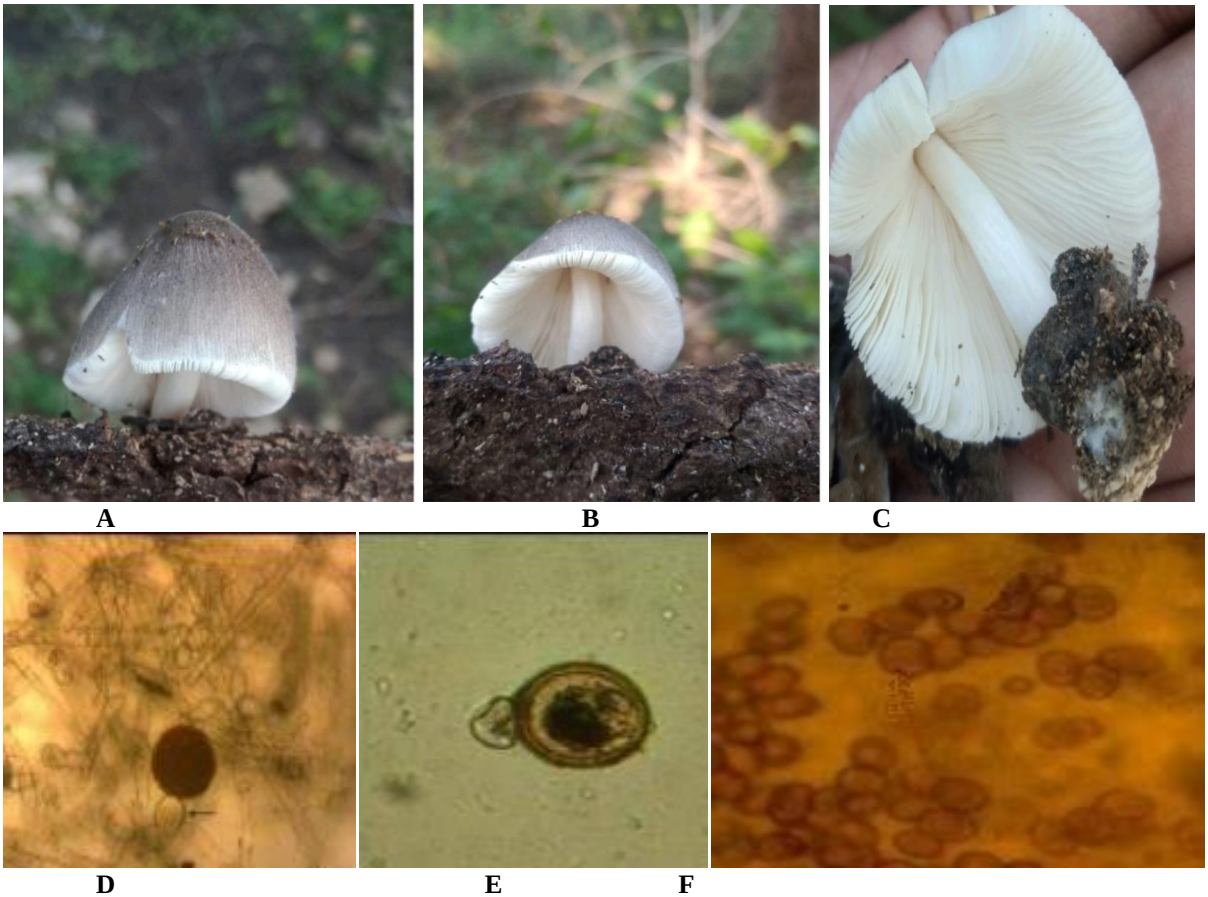
These mushrooms' nutritional content varies depending on the sort of agricultural waste utilized in their development. The significance of *V. volvacea* in terms of culture, economy and nutrition has lately come to light due to its potential as health enhancer and in the production of pharmaceuticals and nutraceuticals. Very little data and reporting exist regarding the amount of mushrooms that are grown and harvested. Their chemical compositions and medicinal properties that could be utilized to ascertain the dynamics of this mushrooms market in our country.

The Present article reviews the current level of knowledge regarding the cultivation, chemical make-up, nutritional value, and medicinal properties of *V. volvacea*.

Volvariella volvacea

V. speciosa, V. bombycine, V. gloiocephala, V. hypopithys, V. iranica, V. jamaicensis, V. lepiotospora, V. peckii, V. coesiotincta V. sathei, V. surrecta, and V. volvacea are the various types of *Volvariella* that may be found worldwide. *Volvariella volvacea*, one of these species, is frequently utilized for food purposes. It is also referred to as a straw mushroom, a Chinese mushroom, or a paddy straw mushroom since it thrives on paddy straw[6]. This particular fungus has a white pileus and a tall stape. It is also referred to as "Nanhua mushroom" or "Tributary mushroom." The Nanhua Temple of Chaohsi in northern Kwangtung Province, China, is where the term Nanhua originated.

Volvariella volvacea thrives between 28 and 35°C and is also renowned for its distinctive flavor and texture[7]. It is typically grown in tropical, subtropical and temperate regions of the Eastern and Western hemisphere using agricultural wastes, such as cotton and rice wastes, as growing substrate[8]. This species is seen growing naturally on waste materials such as dead leaves, dead wood, stumps, animal droppings[9]. *Volvariella volvacea* grow vigorously on a variety of materials in addition to rice straw, including palm oil bunch wastes, water hyacinth, banana leaves, pericarp wastes, and cotton waste[10]. Free lamellae, an exannulate stipe, and a volvate base, pink-colored spores, are characteristics of straw mushrooms under the microscope.



(A) Volvariella volvacea – On dead wood (Lignicolous and Saprobic), (B) *Volvariella volvacea*– Attachment of stipe to pileus (C) *Volvariella volvacea*– Arrangements of gills on hymenium (D) *Volvariella volvacea* – Double walled chlamydospore (Asexual spores) (E) *Volvariella* volvacea - Double walled chlamydospore (Asexual spores) with partial protoplasm (F) *Volvariella volvacea*– Oval shaped Basidiospores (sexual spores).

This mushroom gets mature in near about 4 days and is the easiest to grow easiest to grow. It is often referred to as a warm mushroom since it can survive in hot climates (30–36°C). The pharmacological activities of *Volvariella volvacea* include anti-tumor, immunosuppressive, and immunomodulatory effects[11]. Despite having lower market appeal than button, oyster, or shiitake mushrooms, they nonetheless account for 6% of worldwide production[12].

Cultivation of *Volvariella volvacea*

A tropical fungus called *Volvariella volvacea* needs relatively warm temperatures to grow vegetatively and bear fruit. In an open field, it is grown on straw beds or with the aid of wooden frames. The output of mushrooms is quite modest (10–15 percent of dry substrate), while being the oldest and most widely used technique. The reason for this is that straw by itself is insufficient as a composting material since it lacks essential nutrients and decomposes slowly.

In *volvariella* sp.'s developmental stages, pectinolytic enzymes such as cellulases, hemicellulases, and lignases play a crucial role. Certain nutrients may be required to start the creation of enzymes for greater growth. For crops to be produced, the substrate must include the key macro elements potassium, calcium, magnesium, phosphorus, nitrogen, and sodium. In order to promote fruit body formation and development, these crucial nutrients are typically supplied to the substrate[13].

As a result, various materials than straw are now used to cultivate mushrooms, including cotton waste[14]. Cocoa bean shells, sawdust mixed with the fungus *Glaricidia*[15]. Growing on these substrates has produced a noticeable increase in biological efficiency (by two or three times) and a more consistent production yield.

In contrast to rice husk and sawdust wastes, *Volvariella volvacea* fruiting bodies notably responded to palm fiber wastes in terms of development and yield, according to Ukoima HN et al[16]. Paddy straw mushroom yields were much higher when oil palm bunch waste was used in place of rice straw or by itself[17]. Investigations were conducted into the effects of various lignocelluloses wastes on the growth of mycelia and the yield of *Volvariella volvacea*[18]. According to the findings, wheat grain with rice bran produced the highest production of *Volvariella volvacea*.

The impact of various extracts from edible mushrooms on the fruiting body of *Volvariella volvacea* development. According to these findings, adding *Pleurotus ostreatus* aqueous extract to culture media caused straw mushrooms to develop more quickly and with denser mycelia than they would have under contro[19]. The yield of early mature fruiting bodies rose by up to 40% in comparison to control when the diluted *Pleurotus ostreatus* extract was sprayed three to four times on fully colonized damp cotton waste of straw mushrooms.

Chemical Composition

The nutritive value and sensory characteristics of mushrooms are governed by their chemical makeup. *Volvariella volvacea* contain 90% water, high in protein, chitin, vitamins, fats (5.8%), carbohydrates (56.8%), amino acids (including all essential amino acids), unsaturated fatty acids, and essential minerals.

The scent of this mushroom is due to the presence of octavalent carbonate alcohols and carbonyl compounds. They may not have any nutritionally necessary functions, but they do increase hunger and give foods with mushrooms their distinctive flavor. Amino acids, nucleotides, and other substances like phosphorus, nitrogen, potassium, sulfur, iron, and zinc, as well as the auto-oxidation of unsaturated fatty acids, all have a role in the scent of mushrooms[20].

Secondary metabolites

Volvariella volvacea is a good source of phenolic compounds such flavonoids, phenolic acids, and tannins polypeptides, terpenes, steroids that support a high antioxidant capacity[21]. Five well-known mushrooms' nutritional makeup and antioxidant activity were described by Hung PV and Nhi NNY [22]. Antioxidant activity offers defense against the hazards of long-term angiogenic illnesses like cancer, arthritic, cardiovascular, and joint problems. The highest concentrations of the superoxide dismutase, antioxidants catalase, glutathione peroxidase, glutathione reductase and glutathione-S-transferase, were found in mycelial mats and dried straw mushrooms[23]. Due to *Volvariella volvacea*'s calcium carbonate action, high levels of antioxidative compounds (variegatic acid and diboviquinone) found[24].

Conclusion

It is decisively believed that the extensive details on the phytochemical and other biological qualities of *Volvariella volvacea*, may provide comprehensive evidence for its usage in various medications. Long-standing usage of the fruiting bodies in traditional medicine has been validated by recent studies. However, the therapeutic benefits now understood based on its biochemical components are insufficient, thus additional clinical and pathological studies must be carried out to explore the untapped potential of this mushroom.

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