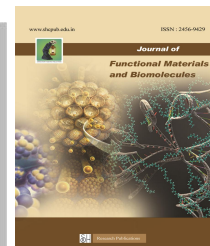




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## NUTRITIONAL AND MEDICAL ASPECTS OF BUTTON MUSHROOMS (*AGARICUS BISPORUS*) IN FRESH AND DRIED FORMS: A COMPREHENSIVE REVIEW

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### Abstract

Mushrooms have been recognized as important food items since ancient times because of their nutritional values and therapeutic properties. The present study examines nutritional and medical aspects of button mushrooms (*Agaricus bisporus*) in fresh and dried extract. Provide a summary of the key findings from the review, touching on the nutritional value of fresh and dried button mushrooms, the changes that occur during drying, and their potential health benefits. Mention the importance of button mushrooms in human diets and their value as a sustainable food source. Mushrooms have become one of the most important sources of functional food and medicines in recent years. The demand for edible mushrooms has increased due to their taste, flavor, and nutrient content. Mushrooms are better alternatives to animal proteins and other animal products, and this fact has been supported through various studies conducted in the past. Several forms of vitamins in mushrooms are responsible for improving health by decreasing the risk of various diseases in humans.

**Keywords:** Mushrooms, *Agaricus bisporus*, health benefits and nutritional aspects.

### 1. Introduction

Button mushrooms (*Agaricus bisporus*) have an important place in the world trade of fresh produce

because they contain important bioactive compounds such as vitamins, minerals, polyphenolics, and flavonoids preferred by most consumers. Since button mushrooms have a very short shelf life after harvesting, special protection techniques are required to maintain their quality and freshness. Mushrooms have been collected and consumed since times immemorial for their nutrition and flavor. They have high protein, low fat, high fiber and all essential amino acids and contain all important minerals too. Moreover, mushrooms are the only vegetable source of vitamin D [1].

Mushrooms are also known for their medicinal properties like immunomodulation, anti-cancer, anti-hypertensive, anti-diabetic, antiviral, antibacterial, nephro-protective and livoprotectiv. Also, the mushroom cultivation is environmental friendly, capable of converting the lignocellulose waste materials into food, feed and fertilizers. The button mushroom *Agaricus bisporus* is one of the most widely cultivated edible mushroom species in the world and its commercial cultivation is over three centuries old. The world production level for 2014 is estimated at 5 million tons [2].

### 2. Historical Background

*Agaricus bisporus* is an edible basidiomycete mushroom native to grasslands in Europe and North

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America. Commonly known as white button mushroom, is widely cultivated in most countries and it constitutes the bulk of all mushrooms consumed in the United States and Australia. Historical evidence indicates that it was first cultivated in France and that cultivar strains originated in Western Europe. Ancient Egyptians believed mushrooms could grant immortality and thus, only the pharaohs were deemed worthy of eating or even touching them. In ancient Rome, mushrooms were often referred to as food for the gods [3]. The Fig.1. Shows the *Agaricus Bisporus* in fresh and dried Forms are below,



**Fig.1. *Agaricus Bisporus* in fresh and dried Forms**

In Russia, China, Mexico and other world cultures, folklore held that mushrooms conferred superhuman strength. Conventionally, the fungus was used in the treatment of cancer, cerebral stroke and heart diseases. Furthermore, it has anti-aging property. They represent as one of the world's greatest untapped resources of nutrition and palatable food of the future. Mushrooms have been found to be more effective against cancer, cholesterol reduction, stress, insomnia, asthma, allergies and diabetes. They can be used to bridge the protein malnutrition gap because they have a high amount of protein. Mushrooms are useful to increase the immunity. Hence, it provides a nutrient supplement as a form of tablets. They are also useful for diabetic and patients with cardiovascular disorders (because they contain low starch and low cholesterol). One-third of the iron in the mushrooms is available in free form. Their polysaccharide content is used as an anticancer drug and combat HIV effectively [4].

Biologically active compounds from the mushrooms possess antifungal, antibacterial, antioxidant, antiviral

properties and have been used as insecticides and nematicides as well. There have been studies that demonstrate that women who eat these button mushrooms daily have reduced chances of getting breast cancer. The mushrooms can be thought to inhibit the production of enzymes that affect the production of estrogen which is a hormone that causes cancer to develop [5].

### 3. Nutritional Composition of Fresh Button Mushrooms

The nutritional components of *A. bisporus* are found in rich amounts of carbohydrates, proteins, and fats as compared to some other widely consumed species. The macro and micronutrients present in fresh button mushrooms low in carbohydrates and high in fibre, which is a major source of prebiotics, High-quality protein that contains all the required amino acids but is not as complete as that found in animals. Extremely low in fat; includes linoleic acid and other polyunsaturated fatty acids. The Vitamins are riboflavin, niacin, pantothenic acid, folate and vitamin C are examples of micronutrients. Minerals contain rich sources of iron, copper, selenium, potassium, and phosphorus [6].

### 4. Changes in Nutritional Composition during Drying

Drying is a frequent and the first preservation method used on mushrooms. The goal of this process is to reduce the moisture content (until, normally, around 13%), which prevents: microbial growth; enzymatic or non-enzymatic reactions; and physiological and morphological damages [7]. In general, the quality of the dried mushrooms is evaluated by several factors, such as colour, rehydration rate, texture, flavour and the nutrition quality, which is mainly assessed regarding the protein and total sugar content. There are several techniques for drying edible mushrooms including: natural air drying, solar drying, hot air drying (HAD), thin layer drying, vacuum drying (VD), freeze-drying (FD), microwave drying (MD) or a combination of various technologies to improve the drying efficiency and product quality [8]. Dried mushrooms have a more intense flavour comparing to

fresh ones, however, their nutrients and bioactive compounds can be easily altered during drying.

## 5. Health Benefits of Fresh and Dried Button Mushrooms

Fresh and dried button mushrooms both offer a variety of health benefits, making them a valuable addition to any diet. Fresh button mushrooms are rich in essential nutrients, including vitamins (such as B-vitamins, especially riboflavin and niacin), minerals like potassium and selenium, and dietary fiber. These nutrients contribute to improved immune function, enhanced energy levels, and better digestion [9].

Additionally, button mushrooms contain antioxidants that help protect cells from oxidative damage. Dried button mushrooms, though more concentrated in flavor and nutrients, retain many of the health benefits of their fresh counterparts but with a higher concentration of minerals, such as potassium, and bioactive compounds. They also have a longer shelf life, making them a convenient option for adding nutritional value to meals. Both forms are low in calories, cholesterol-free, and can support heart health, weight management, and even promote better skin due to their antioxidant properties [10].

### 5.1. Antioxidant Activity

Both fresh and dried button mushrooms are rich in antioxidants, though the drying process can concentrate these beneficial compounds. Fresh button mushrooms contain key antioxidants such as ergothioneine, a unique amino acid known for its ability to protect cells from oxidative damage, and glutathione, a powerful molecule that aids in detoxification and reduces oxidative stress [11].

In addition, fresh mushrooms have polyphenols, which are known for their anti-inflammatory and antioxidant properties, contributing to the protection of tissues and potentially reducing the risk of chronic diseases like heart disease and cancer. When button mushrooms are dried, the antioxidants become more concentrated due to the loss of water content. As a result,

dried button mushrooms may offer an even higher level of antioxidant activity, particularly in terms of phenolic compounds, which have strong anti-inflammatory effects and can support immune health [12].

The drying process can also enhance the shelf life of mushrooms, making it a convenient way to enjoy their antioxidant benefits year-round. Overall, both fresh and dried button mushrooms provide significant antioxidant protection, helping to neutralize free radicals, reduce inflammation, and support long-term health.

### 5.2. Anticancer activity

Fresh and dried button mushrooms both possess potential anticancer properties, and their bioactive compounds that help fight the development and spread of cancer cells. Fresh Button mushrooms contain polysaccharides, particularly beta-glucans, which are known for their immune-boosting effects and may help inhibit the growth of tumors by enhancing the body's immune response [13].

These mushrooms also contain compounds like ergothioneine and glutathione, which act as potent antioxidants, protecting cells from DNA damage and oxidative stress, both of which are linked to cancer development. Additionally, fresh button mushrooms have been shown to have anti-inflammatory properties, and chronic inflammation is a known risk factor for cancer [14].

Dried button mushrooms retain many of these anticancer properties but in more concentrated forms due to the removal of water content during the drying process. In particular, dried mushrooms are rich in phenolic compounds and polysaccharides, which have been linked to inhibiting the proliferation of cancer cells and inducing apoptosis (programmed cell death) in certain types of cancer, such as breast and liver cancer. Furthermore, both fresh and dried button mushrooms contain compounds that may help block the formation of blood vessels that supply tumors, a process known as angiogenesis, which is essential for cancer growth and metastasis. By including both fresh and dried button mushrooms in the diet, individuals may support their body's defense against

cancer by harnessing the potent anticancer effects of these mushrooms' bioactive compounds [15].

### 5.3. Anti-diabetic Activity

Both fresh and dried button mushrooms exhibit promising antidiabetic properties, making them a beneficial addition to a diabetes-friendly diet. Fresh button mushrooms are low in carbohydrates, have a low glycemic index, and are high in dietary fiber, which helps regulate blood sugar levels by slowing the absorption of glucose into the bloodstream. They also contain bioactive compounds like polysaccharides, particularly beta-glucans, which have been shown to enhance insulin sensitivity and help modulate blood sugar levels. Additionally, fresh button mushrooms are rich in minerals such as potassium and magnesium, which play key roles in blood sugar regulation and improve insulin function. When button mushrooms are dried, their bioactive components become more concentrated, potentially increasing their antidiabetic effects. Dried button mushrooms retain polysaccharides, which may help reduce the risk of insulin resistance, a precursor to type 2 diabetes. The antioxidants present in both fresh and dried button mushrooms also contribute to better blood sugar control by reducing oxidative stress, a factor that can impair insulin sensitivity and exacerbate diabetes. Regular consumption of button mushrooms, in both fresh and dried forms, can thus be part of a holistic approach to managing blood sugar levels, preventing insulin resistance, and supporting overall metabolic health [16].

### 5.4. Antimicrobial Properties

Both fresh and dried button mushrooms possess antimicrobial properties that can help protect the body against harmful pathogens. Fresh button mushrooms contain natural compounds, including ergothioneine and phenolic acids, which have been shown to exhibit antimicrobial effects against a variety of bacteria, fungi, and viruses. These compounds help inhibit the growth of harmful microorganisms by interfering with their metabolic processes, reducing their ability to proliferate. Studies have shown that fresh mushrooms can be

particularly effective against certain pathogenic bacteria, such as *Staphylococcus aureus* and *Escherichia coli*, as well as fungi like *Candida albicans* [17].

When button mushrooms are dried, the antimicrobial compounds become more concentrated due to the removal of water, potentially enhancing their ability to combat microbes. Dried button mushrooms retain their antimicrobial properties and can be used as a natural, long-lasting food preservative, preventing spoilage and inhibiting the growth of bacteria and molds during storage. In both fresh and dried forms, button mushrooms contribute to maintaining a balanced gut microbiome, which is essential for overall immune health and disease resistance. Whether consumed fresh or dried, button mushrooms can offer a natural defense against infections and help support the body's immune system by combating harmful microorganisms [18].

### 5.5. Anti obesity Activity

Both fresh and dried button mushrooms exhibit anti-obesity properties, making them an excellent addition to weight management strategies. Fresh button mushrooms are low in calories but high in fiber, particularly beta-glucans, which help promote satiety by slowing digestion and reducing appetite. Their high water content further contributes to a feeling of fullness, which can prevent overeating and help with portion control. The low glycemic index of button mushrooms means they have a minimal impact on blood sugar levels, preventing the insulin spikes that often lead to fat storage [19].

Additionally, the presence of bioactive compounds like ergothioneine and phenolic acids in fresh mushrooms may contribute to reducing inflammation, which is a key factor in obesity and related metabolic disorders. Dried button mushrooms retain many of these anti-obesity benefits, with the added advantage of more concentrated nutrients due to the removal of water during the drying process. The higher concentration of dietary fiber and antioxidants in dried mushrooms can enhance their role in weight management by improving digestion, promoting gut health, and reducing fat accumulation.

The compounds found in both fresh and dried button mushrooms have also been linked to the regulation of fat metabolism, possibly preventing excessive fat storage and encouraging the breakdown of stored fat. By including both fresh and dried button mushrooms in the diet, individuals can support healthy weight management while benefiting from the anti-obesity effects of these versatile mushrooms [20].

## 6. Conclusion

In conclusion, button mushrooms (*Agaricus bisporus*) in both their fresh and dried forms offer significant nutritional benefits, making them a valuable addition to a balanced diet. Fresh button mushrooms are rich in essential vitamins, minerals, antioxidants, and dietary fiber, contributing to improved immune function, digestive health, and overall well-being. They are particularly low in calories and fat, making them ideal for weight management and supporting heart health. Dried button mushrooms, while similar in nutrient profile, have a more concentrated level of bioactive compounds due to the dehydration process, which enhances their antioxidant, antimicrobial, and potential anti-cancer properties. Both forms are versatile and can be used in a variety of culinary applications, offering a convenient and nutritious option year-round.

The unique combination of essential nutrients, antioxidants, and bioactive compounds in button mushrooms supports a range of health benefits, from boosting the immune system to potentially managing chronic conditions like diabetes, obesity, and even cancer. Whether consumed fresh or dried, button mushrooms are an excellent source of nutrition that can contribute to overall health and well-being.

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