

Mushrooms and Their Significance

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ABSTRACT: A **mushroom** or **toadstool** is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground, on soil, or on its food source.

The standard for the name "mushroom" is the cultivated white button mushroom, *Agaricus bisporus*; hence the word "mushroom" is most often applied to those fungi (Basidiomycota, Agaricomycetes) that have a stem (stipe), a cap (pileus), and gills (lamellae, sing. lamella) on the underside of the cap. "Mushroom" also describes a variety of other gilled fungi, with or without stems, therefore the term is used to describe the fleshy fruiting bodies of some Ascomycota. These gills produce microscopic spores that help the fungus spread across the ground or its occupant surface.

Forms deviating from the standard morphology usually have more specific names, such as "bolete", "puffball", "stinkhorn", and "morel", and gilled mushrooms themselves are often called "agarics" in reference to their similarity to *Agaricus* or their order Agaricales. By extension, the term "mushroom" can also refer to either the entire fungus when in culture, the thallus (called a mycelium) of species forming the fruiting bodies called mushrooms, or the species itself.

A mushroom develops from a nodule, or pinhead, less than two millimeters in diameter, called a primordium, which is typically found on or near the surface of the substrate. It is formed within the mycelium, the mass of threadlike hyphae that make up the fungus. The primordium enlarges into a roundish structure of interwoven hyphae roughly resembling an egg, called a "button". The button has a cottony roll of mycelium, the universal veil, that surrounds the developing fruit body. As the egg expands, the universal veil ruptures and may remain as a cup, or volva, at the base of the stalk, or as warts or volval patches on the cap. Many mushrooms lack a universal veil, therefore they do not have either a volva or volval patches. Often, a second layer of tissue, the partial veil, covers the blade-like gills that bear spores. As the cap expands, the veil breaks, and remnants of the partial veil may remain as a ring, or annulus, around the middle of the stalk or as fragments hanging from the margin of the cap. The ring may be skirt-like as in some species of *Amanita*, collar-like as in many species of *Lepiota*, or merely the faint remnants of a cortina (a partial veil composed of filaments resembling a spiderweb), which is typical of the genus *Cortinarius*. Mushrooms lacking partial veils do not form an annulus. The stalk (also called the stipe, or stem) may be central and support the cap in the middle, or it may be off-center and/or lateral, as in species of *Pleurotus* and *Panus*. In other mushrooms, a stalk may be absent, as in the polypores that form shelf-like brackets. Puffballs lack a stalk, but may have a supporting base. Other mushrooms, such as truffles, jellies, earthstars, and bird's nests, usually do not have stalks, and a specialized mycological vocabulary exists to describe their parts.

The way the gills attach to the top of the stalk is an important feature of mushroom morphology. Mushrooms in the genera *Agaricus*, *Amanita*, *Lepiota* and *Pluteus*, among others, have free gills that do not extend to the top of the stalk. Others have decurrent gills that extend down the stalk, as in the genera *Omphalotus* and *Pleurotus*. There are a great number of variations between the extremes of free and decurrent, collectively called attached gills. Finer distinctions are often made to distinguish the types of attached gills: adnate gills, which adjoin squarely to the stalk; notched gills, which are notched where they join the top of the stalk; adnexed gills, which curve upward to meet the stalk, and so on. These distinctions between attached gills are sometimes difficult to interpret, since gill attachment may change as the mushroom matures, or with different environmental conditions

KEYWORDS: mushrooms, significance, toadstool, fruiting bodies, gills, button, stipe, annulus

I. INTRODUCTION

An often under-appreciated food, mushrooms have been eaten and used as medicine for thousands of years. Traditional and folk medicine practitioners laud the bell-shaped fungi for their healing and cleansing properties. All varieties of mushrooms are low in calories and fat, and contain modest amounts of fiber and various nutrients. Perhaps the more interesting properties of mushrooms are their non-nutritive plant substances—polysaccharides, indoles, polyphenols, and carotenoids in which cell and animal studies have shown antioxidant, anti-inflammatory, and anticancer effects. [1] Mushrooms are also recognized by chefs for their ability to create savory rich flavors called umami, thanks to the

presence of an amino acid called glutamate, which is also found in meats, fish, cheeses, and simmering soups. Although considered a vegetable, mushrooms are neither a plant nor animal food. They are a type of fungus that contains a substance called ergosterol, similar in structure to cholesterol in animals. Ergosterol can be transformed into vitamin D with exposure to ultraviolet light. Mushrooms vary in appearance with more than 10,000 known types, but generally they are distinguished by a stem, fleshy rounded cap, and gills underneath the cap. China and the U.S. are among the top five producers of mushrooms worldwide.[2,3]

Source Of

- B vitamins (B2, B3, folate, B5)
- Phosphorus
- Vitamin D
- Selenium
- Copper
- Potassium

Because mushrooms sold in supermarkets are usually grown in dark, controlled environments indoors, they will contain little if any vitamin D. But some manufacturers expose mushrooms to ultraviolet (UV) light to increase their content of vitamin D, either by natural sunlight or a UV lamp. A substance in mushrooms called ergosterol then produces vitamin D2 (ergocalciferol), a form found only found in plants. Vitamin D2 is also added to fortified foods and supplements. The other main form of vitamin D is D3 (cholecalciferol) found in animal foods (egg yolks, oily fish) and supplements. Both will effectively raise blood levels of vitamin D, though D3 may be absorbed slightly better and break down more slowly than D2. Humidity and cooking mushrooms in water do not appear to affect vitamin D content in mushrooms, but cooking them in fat (such as oils) can cause the vitamin to leach out because it is fat-soluble. Edible mushrooms like maitake and shiitake have also been used as medicine throughout history. Other mushrooms that are too tough to eat have been used solely for medicinal purposes such as reishi. Plant chemicals and components in mushrooms may exert antioxidant, anti-inflammatory, and anticancer effects, but the exact mechanism is still unclear and an area of active research.[4,5]



Mushrooms

[4] Animal and cell studies show that mushrooms can stimulate the activity of immune cells, macrophages, and free radicals that can stop the growth and spread of tumor cells and cause existing tumor cells to die. [5] Various

polysaccharides in mushrooms including beta-glucans are believed to exert these cancer-fighting properties. [4,6] Fruiting bodies of some mushrooms occur in arcs or rings called fairy rings. The mycelium starts from a spore falling in a favourable spot and producing strands (hyphae) that grow out in all directions, eventually forming a circular mat of underground hyphal threads. Fruiting bodies, produced near the edge of this mat, may widen the ring for hundreds of years. [7,8]



Fairy rings

II. OBSERVATIONS

Mushroom types and uses

1. **White button mushroom:** The most common and mildest-tasting mushroom around. Ninety percent of the mushrooms we eat are this variety. Less intensely flavored than many of its more exotic kin, it can be eaten either raw or cooked, and works well in soups and salads, and on pizzas.



2. **Crimino mushrooms:** A crimino is a young portobello. Although the crimino is darker, firmer and more flavorful than its cousin the white button mushroom, the two can be used interchangeably. Increasingly, retailers hoping to capitalize on the popularity of the portobellos are selling crimini mushrooms as "baby bellas."



3. **Portobello mushrooms:** Common in Italian cooking, dense, rich portobellos lend depth to sauces and pastas and make a great meat substitute. When portobellos are young and small, they're called criminis. If you want a bun-substitute, you can even use the mushroom's flat cap. Mushrooms of this variety are as wide as the palm of your hand, and their meaty texture stands up to grilling and stuffing [9,10]



4. **Shiitake mushrooms:** In Japanese, shiitake means "oak fungus," which describes where the mushrooms can be found in the wild. These days, however, most shiitakes are cultivated. They're best identified by their umbrella-shaped brown caps, which curl under ever so slightly. Fresh shiitakes have a light woody flavor and aroma, while their dried counterparts are more intense.



5. **Maitake mushrooms:** From afar, this mushroom can look like a head of cabbage. Cultivated, as well as found in the woods, these mushrooms are often sold in clusters with their soft, feathery caps overlapping. This mushroom has an earthy aroma and a gamy flavor, and is native to both the northwestern United States and Japan. They grow wild east of the Mississippi River in August and September.[11,12]



6. **Oyster mushrooms:** Although these can be found in the wild growing on the sides of trees, the ones you'll find in the store or on a menu are most likely cultivated. Like their namesakes, they're whitish in color and fan-shaped, and possess a delicate odor and flavor. Oyster mushrooms are found in many Japanese and Chinese dishes such as soups and stir-fries.



7. **Enoki mushrooms:** The edible variety of these mushrooms feature small, shiny white caps attached to thin stems and possess a distinctive crunch. They're good raw. In the wild, they grow on Chinese Hackberry trees, ash trees, mulberry trees, and persimmon trees.



8. **Beech mushrooms:** Cooked, these crunchy brown-capped clusters are crunchy with a sweet nuttiness. Raw, however, they taste bitter.[13,14]



9. **King trumpet mushroom:** It's all about the thick, meaty stem on this jumbo mushroom



10. **Black trumpet mushroom:** This wavy fungi is a late-summer find in the Midwest and East and grows all winter in the West. Black trumpets have a rich, smoky flavor and notes of a black truffle mushroom when dried.



11. **Chanterelle mushrooms:** Trumpet-like, with a depression in the center of its cap, the chanterelle is one of the most popular wild mushrooms. (Because they're notoriously difficult to cultivate, chanterelles are usually foraged in the wild.) Golden-hued, fleshy and firm, they're described as having an apricot-like scent. They're common in many European cuisines, including French and Austrian, and are also native to the United States. They are particularly abundant in the West and Pacific Northwest from September into the cold months[15,16]



12. **Hedgehog mushrooms:** With a sweet smell and taste, it makes sense that this mushroom is also called the "sweet tooth" (unless the mushroom is older — then it can take on a bitter flavor). Crunchy, nutty and meaty, this mushroom tastes very similar to a chanterelle. This hardy mushroom grows in the winter on the West Coast.



13. **Morel mushrooms:** A fleeting springtime treat in the Midwest and West. You can't mistake its conical, spongy look and woody flavor.



14. **Porcino mushrooms:** Slightly reddish-brown in color, porcini are one of the most prized wild mushrooms, sought out for their smooth texture and aromatic, woody flavor. They're popular in Italy, as well as in France, where they're called cèpes. Fresh porcini aren't as easy to locate in the United States, but dried ones are easily reconstituted by soaking in hot water. Prized in Italy, these have a brief summer season in the East and pop up in the spring and fall on the West Coast.[17,18]



Many mushrooms are poisonous

1. Death Cap (*Amanita phalloides*)



Within 6 to 12 hours after consumption, violent abdominal pain, vomiting, and bloody diarrhea appear, causing rapid loss of fluid from the tissues and intense thirst. Signs of severe involvement of the liver, kidneys, and central nervous system soon follow, including a decrease in urinary output and a lowering of blood sugar. This condition leads to coma and death in more than 50 percent of the incidents.

2. *Conocybe filaris*



The onset of gastrointestinal symptoms often occurs 6-24 hours after the mushrooms were consumed, frequently leading to an initial misdiagnosis of food poisoning or the stomach flu. The patient may appear to recover, only to suffer from a life-threatening reappearance of the gastrointestinal distress, coupled with liver and kidney failure. [19,20]

3. Webcaps (*Cortinarius species*)



These mushrooms feature a poison known as orellanin, which initially causes symptoms similar to the common flu. Orellanin has an insidiously long latency period and may take 2 days to 3 weeks to cause symptoms, often leading to a misdiagnosis. The toxin ultimately causes kidney failure and death if left untreated.

4. Autumn Skullcap (*Galerina marginata*)



Galerina marginata is a gilled, wood-rotting mushroom with the same amatoxins as the death cap mushroom. Ingestion causes diarrhea, vomiting, hypothermia, and liver damage, and can result in death if left untreated.

5. Destroying Angels (*Amanita species*)



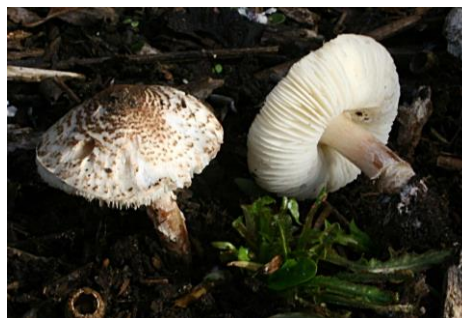
Symptoms take 5 to 24 hours to appear and include vomiting, delirium, convulsions, diarrhea, liver and kidney failure, and often lead to death.[21,22]

6. *Podostroma cornu-damae*



Its red fruiting bodies contain potent toxins known as trichothecene mycotoxins and can cause multiple organ failure in those unlucky enough to consume them. Symptoms of poisoning include stomach pain, peeling skin, hair loss, low blood pressure, liver necrosis, acute kidney failure, and result in death if left untreated.

7. **Deadly Dapperling (*Lepiota brunneoincarnata*)**



Accidental consumption leads to severe liver toxicity and can have lethal consequences if immediate treatment is not received.[23]

III. RESULTS AND CONCLUSION

Some mushrooms are used in folk medicine. In a few countries, extracts, such as polysaccharide-K, schizophyllan, polysaccharide peptide, or lentinan, are government-registered adjuvant cancer therapies, but clinical evidence for efficacy and safety of these extracts in humans has not been confirmed. Although some mushroom species or their extracts may be consumed for therapeutic effects, some regulatory agencies, such as the US Food and Drug Administration, regard such use as a dietary supplement, which does not have government approval or common clinical use as a prescription drug. Mushrooms can be used for dyeing wool and other natural fibers. The chromophores of mushroom dyes are organic compounds and produce strong and vivid colors, and all colors of the spectrum can be achieved with mushroom dyes. Before the invention of synthetic dyes, mushrooms were the source of many textile dyes. Some fungi, types of polypores loosely called mushrooms, have been used as fire starters (known as tinder fungi). Mushrooms and other fungi play a role in the development of new biological remediation techniques (e.g., using mycorrhizae to spur plant growth) and filtration technologies (e.g. using fungi to lower bacterial levels in contaminated water). [23]

REFERENCES

1. Harding, Patrick (2008). Mushroom Miscellany. HarperCollins. p. 149. ISBN 978-0-00-728464-1.
2. ^ Ramsbottom J. (1954). Mushrooms & Toadstools: a study of the activities of fungi. London: Collins.
3. ^ Hay, William Deslisle (1887). An Elementary Text-Book of British Fungi. London, S. Sonnenschein, Lowrey. pp. 6–7.
4. ^ Arora, David (1986). Mushrooms Demystified, A Comprehensive Guide to the Fleshy Fungi. Ten Speed Press. pp. 1–3. ISBN 978-0-89815-169-5.
5. ^ "Toadstool". Online Etymology Dictionary, Douglas Harper, Inc. 2012.

6. ^ Dickinson C, Lucas J (1982). VNR Color Dictionary of Mushrooms. Van Nostrand Reinhold. pp. 9–11. ISBN 978-0-442-21998-7.
7. ^ Ammirati et al., 1985, pp. 40–41.
8. ^ Volk T. (2001). "*Hypomyces lactifluorum*, the lobster mushroom". Fungus of the Month. University of Wisconsin-La Crosse, Department of Biology. Retrieved 2008-10-13.
9. ^ Miles PG, Chang ST (2004). Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact. Boca Raton, Florida: CRC Press. ISBN 978-0-8493-1043-0.
10. ^ Stuntz et al., 1978, pp. 12–13.
11. ^ Stuntz et al., 1978, pp. 28–29.
12. ^ Ammirati et al., 1985, pp. 25–34.
13. ^ Nelson N. (2006-08-13). "*Parasola plicatilis*". Archived from the original on 2013-01-02. Retrieved 2008-10-13.
14. ^ Venturella, G. 2006. *Pleurotus nebrodensis*. In: IUCN. 2009. IUCN Red List of Threatened Species. Version 2009.1. <http://www.iucnredlist.org/apps/redlist/details/full/61597/0> Downloaded on 15 October 2009.
15. ^ "A Humongous Fungus Among Us", Dinosaur in a Haystack, Harvard University Press, 1995, pp. 335–343, doi:10.4159/harvard.9780674063426.c38, ISBN 978-0-674-06342-6
16. ^ Dodge, S.R. "And the Humongous Fungus Race Continues". US Forest Service: Pacific Northwest Research Station. Retrieved 2011-02-28.
17. ^ Haytowitz DB (2009). "Vitamin D in mushrooms" (PDF). Nutrient Data Laboratory, US Department of Agriculture.
18. ^ Kalaras, M. D.; Beelman, R. B.; Elias, R. J. (2012). "Effects of postharvest pulsed UV light treatment of white button mushrooms (*Agaricus bisporus*) on vitamin D2 content and quality attributes". Journal of Agricultural and Food Chemistry. **60** (1): 220–5. doi:10.1021/jf203825e. PMID 22132934.
19. ^ Koyyalamudi SR, Jeong SC, Song CH, Cho KY, Pang G (2009). "Vitamin D2 formation and bioavailability from *Agaricus bisporus* button mushrooms treated with ultraviolet irradiation" (PDF). Journal of Agricultural and Food Chemistry. **57** (8): 3351–5. doi:10.1021/jf803908q. PMID 19281276. Archived from the original (PDF) on 2011-07-22.
20. ^ Simon, R. R.; Borzelleca, J. F.; Deluca, H. F.; Weaver, C. M. (2013). "Safety assessment of the post-harvest treatment of button mushrooms (*Agaricus bisporus*) using ultraviolet light". Food and Chemical Toxicology. **56**: 278–89. doi:10.1016/j.fct.2013.02.009. PMID 23485617.
21. ^ Cardwell, Glenn; Bornman, Janet F.; James, Anthony P.; Black, Lucinda J. (2018-10-13). "A Review of Mushrooms as a Potential Source of Dietary Vitamin D". Nutrients. **10** (10): 1498.
22. ^ Making Money by growing Mushrooms
23. ^ "Production of Cultivated Edible Mushroom in China With Emphasis on *Lentinula edodes* - isms.biz". isms.biz. Archived from the original on 2017-02-02. Retrieved 2017-01-25.