

Plant Monographs For Mushrooms From Montenegro



Montenegro, 2005



FUNGI - GENERAL CHARACTERISTICS

Fungi make a special and independent kingdom. This group of organisms is very large in a sense of the number of its varieties, its production of biomass and its role in nature. About 100,000 varieties have been described, but there are probably many more.

The vegetative body of a fungus is called mycelium. It contains large number of hyphae that are located in substrates (soil, remains of plants, living plants etc.) and it is difficult to notice it. What we actually see when we are walking in the woods are fruiting bodies of fungi (macromycetes) that are formed on mycelium during the process of reproduction. Spores are formed in fruiting bodies and they, just as the seeds are to plants, have a role in the process of surviving during unfavourable periods and in the processes of expansion and reproduction of the species. Spores are usually disseminated by the wind. When the ecological conditions are favourable, the spores bud in the mycelium.

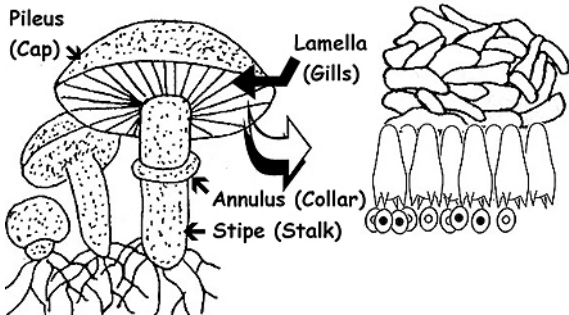
Reproduction of fungi can be either sexual or asexual and the spores are its product. In the process of asexual reproduction, spores are formed on conidiophores or in fruiting bodies. In the process of sexual reproduction, sexual spores are formed in fruiting bodies which may be small – microscopic or big – macroscopic (carpophores, mushrooms). The varieties that form bigger, visible fruiting bodies are called macromycetes and the ones with small fruiting bodies are called micromycetes.

This manual is focused on the macromycetes which have an important role in human nutrition. Their fruiting bodies are nutritionally rich food: they contain high level of phosphor, essential amino acids and various minerals. Their nutritional value grants them a place between meat and vegetables.

One or more fruiting bodies are formed on the mycelium, once or several times a year. The kinds that form fruiting bodies on the surface of the substrate are called aboveground fungi. A smaller number of varieties develop their fruiting bodies under the surface of the ground and they are called underground fungi (Tartuffe).

Fruiting bodies may have different shapes: most well known have mushrooms a cap and a stalk, some however have round, starry, console shaped, stick shaped etc.

Fungi that have fruiting bodies in the shape of mushrooms form spores on the under side of the cap, on the hymenophore which may contain gills, tubes or have a flat surface.



LIFE OF FUNGI, THEIR ROLE AND IMPORTANCE IN NATURE

Fungi are heterotrophic organisms which means that, unlike plants, they feed on decomposed dead or living plant and animal matters.

According to the way of life, fungi may be saprophytes, parasites or form symbiosis with other organisms.

Saprophytes act as recyclers of dead organic material and thus enable the circulation of

matter in nature. Life on earth would not be possible without this process.

Parasites feed on other living organisms, usually doing some degree of harm.

The fungi of the third group form a very specific and mutually useful relation with the plants (some plants cannot bud without the presence of such fungi) and this kind of relation is called symbiosis. Symbiosis is very important for wood trees. Without these fungi, the forests grow much more slowly and they would lose their resistance to diseases. Fungi absorb the water and mineral matters that the plants use in the process of photosynthesis. Due to the fact that they are so closely connected to the plants and due to the crucial role that they play in the natural lifecycle, fungi can be found in all habitats in which plants live. Still, forests remain the habitat of the largest number of fungi varieties.

IMPORTANCE OF FUNGI PROTECTION AND MAJOR FACTORS OF ENDANGERMENT

Fungi are endangered by different factors, such as:

- Degradation and destruction of soil
- Pollution of the environment
- Inadequate and excessive collection and destruction of fruiting bodies etc.

In our region there has been a significant increase of wild collection of fungi for commercial purposes.

Each collector can actively contribute to the preservation of fungi, in the first place by treating them in a diligent manner. In the process of wild collection it is necessary to respect specific rules in order to enhance their sustainable use.

Fruiting bodies may not be picked, since picking damages mycelium. The best way is to slowly twist the fruiting body and then slowly pull it out of the soil. The hole should be filled with the substrate out of which the fungi grew.

Fruiting body should not be cut with a knife at the bottom of the stalk because this may allow parasites to enter and mould to grow which can attack the mycelium and therefore reduce the possibility for further growth of that variety.

Old, maggoty and rotten fruiting bodies should not be collected and sold because they are very perishable. Immature and underdeveloped fruiting bodies should neither be collected nor sold. We need to be very careful with them because edible ones can easily be confused with inedible and poisonous varieties. By leaving a certain number of fruiting bodies - no less than 20% of the total quantity found in one place- one can assure their continuous presence.

Additionally, one should not pick, step on or destroy the unknown and poisonous varieties of fungi, because by doing so we interrupt the lifecycle of fungi which represent an essential component of the ecosystem.

BASIC MACRO MORPHOLOGICAL CHARACTERISTICS OF FRUITING BODIES OF ABIOGENETIC FUNGI

This chapter explains some professional terms that are used in descriptions of macro morphological characteristics of fruiting bodies of abiogenetic fungi.

SOME PROFESSIONAL TERMS

Clustery growth of fruiting bodies – growth of fruiting bodies characterized by the crowded bases of stalks (*Armillaria*)

Tube - A hollow cylinder that contains the basidia where spores are produced in boletes and polypores.

Stalk – lower, narrowed part of fruiting body that has a cap on it.

Hymenium - is the layer of cells containing the spore-bearing cells of the fungus.

Hymenophore - is a collective term for the fleshy structures that bear the hymenium. Thus, in a gilled mushroom, all the gills constitute the hymenophore, and the hymenium is the layer of cells on the surface of those gills. If the hymenophore is on the under side of the cap, we need to pay special attention to the angle between the hymenophore and the stalk if we want to identify the variety.

Spines – structure of a hymenophore which contains large number of upright spines.

Gill - One of the fleshy plates that radiate from the stem on the underside of the cap of many mushrooms.

Scales – they are located on the surface of the cap or on the stalk; they are mainly spotty.

Flesh - The interior tissue of a mushroom.

Mycelium – vegetative body of a fungus, that grows in substrate, out of which the fruiting body develops.

Milk – liquid that flesh and hymenium produce when injured. Milk may be transparent or coloured (which is more often). Milk may change its basic colour when exposed to the air. It is a characteristic of the fungi that belong to Lactarius group.

Net – structure on the surface of the stalk. It may have small or bigger holes. Its lines may be relief-like, colour is the same like the stalk or different. It stretches from the top of the stalk towards the bottom, where it vanishes.

Volva – the remains of a universal veil at the base of the stalk, which covers the whole fruiting body when a fungus is immature. It ruptures as the mushroom matures and leaving tissue flecks at the crown of the caps and remnants at the base of the stalk in the form of volva.

Fruiting body – organ for reproduction that most varieties of fungi form. It has a crucial role in the survival of such varieties. It most often consists of cap, hymenophore and stalk.

Annulus – remains of a partial veil on the stalk. When a fungus is immature, partial veil joins the margin of a cap and a stalk. As the fungus grows, this veil usually remains on the stalk in the form of an annulus.

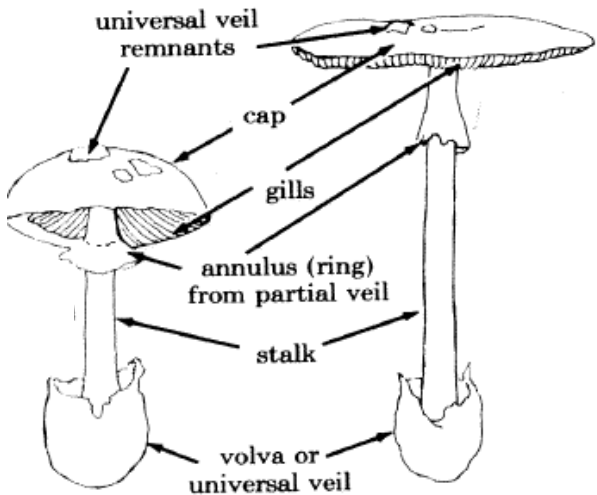
Thin lamellas – structures that look like gills and appear on some varieties of fungi. They may be round or dull and are very narrow.

Partial veil – thin membrane that covers the stalk and cap of an immature mushroom that joins the margin of a cap and a stalk when the fungus is immature.

Stretch marks – lined margin of a cap.

Cap – Upper and widened part of fruiting body.

Universal veil – wraps the whole immature fruiting body.



POST COLLECTION TREATMENT

Fruiting bodies may be exported when they are fresh. After collection, fruiting bodies are classified. Completely healthy and well cleaned mushrooms are considered as first class. Fungi are packed in crates, in no more than two rows and they are transported in cold storages (4 °C). They can be frozen, as well. Quick or deep freezing is performed in purchasing stations, in specialized chambers, where the temperature is from -4°C to -45°C until the purchaser takes over the product. The product is then transported in cold storages where the temperature is from -18°C to -20°C). Such freezing does not damage the cells (small crystals of ice are formed in the cells and they do not damage them), and therefore the quality remains the same.

At home, fungi can be frozen in the same way like other food.

CONSERVATION

Conservation of fungi is performed in different ways. Most frequent methods of conservation are drying, marinating and brining)

DRYING

The process of drying means removing water by applying heat. Fruiting bodies contain, depending on the variety, 90% to 95% of water. The process of drying reduces the water content to 12% (if the percentage is lower, it gets too dry). Fungi are considered dry when they can be easily broken (but not crashed). Mushrooms that are not sufficiently dry perish easily. Out of one kilo of fresh fungi, you may get 110gr to 120gr of dry fungi. All edible fungi can be dried, except orange agarics (*Lactarius*), because they contain milk. The following varieties are particularly good for drying: morel, fairy-ring, and bolete, because the process of

drying improves their taste. Drying is performed in the sun or in dry places or mechanically using dryers or freeze-drying (lyophilisation).

Preparation of Drying:

Goods are cleaned (seldom washed), damaged parts are removed and mushrooms are cut into slices of 5mm wide (slices must not be thinner). Small mushrooms should not be cut (Horn of Plenty (*Craterellus cornucopioides*) and Fairy Ring Mushroom (*Marasmius oreades*)). In that case whole fungi should be dried instead.

Sun Drying:

Goods are put on an adequate surface, preferably aluminum or polyvinyl nets (the holes should be up to 5mm wide, which enables good circulation of air) or threaded made of thin rope. After that, they are exposed to the sun or put in a dry place until the process of drying is completed. If the process does not end in the course of one day, the fungi should be brought inside or covered over night because of the morning dew. Dried fungi should be put in glass jars. The jars need to be well closed. Dried fungi are seldom packed into nylon bags.

Drying in Dryers:

The process of drying in specialized dryers starts with a temperature around 40°C and ends with higher temperature of about 60°C. The process of drying lasts for 10 to 12 hours, depending on the variety and content of moisture in the fruiting body of a fungi.

Lyophilisation (Freeze-Drying):

Lyophilisation is the most modern method of drying. Mushrooms are firstly deep frozen (-60°C to -70°C) and then placed in a vacuum to remove moisture before returning it to room temperature. The low processing temperature and absence of liquid water help to retain colour, flavour and texture of the fungi. However, this method of drying is very expensive.

PREPARATION FOR MARINATING AND BRINING

Goods are cleaned; damaged parts are removed and washed. Bigger fungi are cut into two or more parts. Afterwards, the fungi need to be cooked (blanching) in salty and soured boiling water. Add one spoon of salt and a little lemon juice in one litre of water. Blanching of edible varieties should not last longer than 5 to 7 minutes. Varieties which have to be treated before consumption should be blanched for up to 20 minutes (*Morchella esculenta* and *Armillaria mellea*). After blanching, fungi are being cooled with tap water for about 5 minutes, and then drained for 1 – 2 hours.

Marinating:

Bolete, Champignons, Oyster and Saffron Milkcap (*Lactarius deliciosus*) are particularly good for marinating. Add 1dl of 9% alcoholic vinegar, bay leaf, 5-6 grains of pepper, clover and one spoon of salt into 1 l of water. This solution needs to be boiled and cooled. Prepared fungi are put in glass jars or dishes that are acid-resistant. Pour the prepared solution in the jar or dish. Close it properly. Pasteurization is recommended.

Brining:

The process of brining is very good for Saffron Milkcap (*Lactarius deliciosus*). When the process is properly performed, the Saffron Milkcap can be kept for 2-3 years in this form. Brining is best when done in barrels. For 1kg of fungi one needs water that has been boiled with 15% to 18% of salt. Prepared fungi are put in barrels and cold brining is pored over. Put wooden or plastic bars with a weight on them (a boiled stone can be used as well) to prevent fungi from swimming up to the surface). Cover the barrel with gauze. After 20 days change the salt water. The new solution added should contain 10 –12% salt.

Botanical Name: **Agaricus campestris L.**

English Name: **Meadow Mushroom**



Variety description:

Fruiting body contains a cap and a stalk. Hymenophore is located on the under side of a cap. It is made of gills.

Cap: 3-10 cm wide, in the beginning it is round, than semi round and in the end expanded. Surface of immature mushrooms is smooth, silky and shiny, white, later on it develops brown scales. Edge of cap is bent, immature fungi have whitish remains of a veil. Cap does not change its colour when pressed.

Gills: On immature fruiting bodies they are light pink (never white), than pinkish-brown and in the end dark brown or almost black, dense, narrow and free along stalk.

Stalk: 5-8 cm long, 1-2,5cm wide. It is narrowed and pointed at the bottom, full and fragile, in the beginning it is whitish, with a touch of brown. On the stalk there is a ring (remains of a partial veil) which is underdeveloped and disappears quickly, therefore only immature fungi have it.

Flesh: White, solid, when cut above gills it goes slightly red, it has a pleasant smell and tastes like nuts.

Habitat: This is a typical inhabitant of meadows, pastures, it seldom grows in forests. Fruiting bodies appear in large groups, on the surface of the ground, especially after warm summers.

Related and similar varieties: During collection we need to pay special attention not to mistake this variety with the following ones:

1. DEADLY POISONOUS varieties of Amanita when they are immature and completely undeveloped. Unlike *Agaricus campestris*, this variety has characteristic volva and its gills are white from the very beginning (they are never pink).

2. We can distinguish *Agaricus campestris* from other varieties of mushrooms by the whitish colour of its cap, pinkish gills of immature fungi, transient ring and typical habitat. When cut it goes slightly red. *Agaricus arvensis* and *Agaricus silvicola* are similar to it, they have white gills in the beginning, flesh turns yellow when cut and they have constant rings.

Parts that are collected: Fruiting bodies

Time of collection: July - November

Collection tools: Manual collection only

Method of collection: They are collected by twisting in order to keep mycelium undamaged. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi, together with stalks. Fungi with pinkish gills are particularly in demand. Collected mushrooms are put in straw baskets. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old (brown or almost black gills), maggoty fungi and the ones located close to motorways or junk yards.**

Post-collection treatment: This variety of fungi is used when it is fresh. It may be dried, brined, marinated and frozen.

Botanical Name: *Agaricus macrosporus*
Psalliota arvensis

English Name: Horse Mushroom
Champignon



Variety description: Fruiting body contains a cap and a stalk. Hymenophore is located on the under side of a cap and it is made of gills.

Cap: 0-25 (30)cm wide, in the beginning it semi round, than bell-shaped, than spread, with protuberance in the middle. The edge is bent and it has white remains of the partial veil (tooth-like). It is snowy white with dark yellow scales: during dry days it breaks up in a way which makes it look like a net. It gets slightly yellow when pressed.

Gills: On immature mushrooms are light pink, pink, pink-brown and in the end dark brown or almost black, wide, free and crowded.

Stalk: 7-12 cm long, 2-3 (3.5)cm wide, cylindrical, thick at the bottom, full, fragile, white, later on it gets a bit yellow or brown. On the stalk there is a well developed ring. Upper surface of a ring is smooth, under surface is flaky. The ring is leathery and pending. Stalk above the ring is pink and smooth.

Flesh: White, thick, solid, at the base of a stalk it is brownish, smells like almond, the taste is mild.

Habitat: On meadows, pastures and mountain glades. Fruiting bodies grow in large groups, seldom single.

Related and similar varieties: During collection we need to pay special attention not to mistake this variety with the following ones:

1. DEADLY POISONOUS varieties Amanita when they are immature and completely undeveloped. Unlike *Agaricus macrosporus*, this variety has a characteristic volva and its gills are white from the very beginning (they are never light pink).

2. We can distinguish *Agaricus campestris* from other varieties of *Agaricus* (champignons) by its habitat, by the size of its fruiting body (diameter of the cap: 10-30 cm), which is more than the height of the stalk), the whitish colour of its cap, and its developed ring. It is considered to be the biggest white mushroom. *Agaricus avensis* is similar but much smaller, while *Agaricus excellens* grows mainly in forests.

Parts that are collected: Fruiting body.

Time of collection: July - November

Collection tools: Manual collection only

Method of collection: They are collected by twisting in order to keep mycelium undamaged. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalk and pink to pinkish-brown gills. Don't collect old mushrooms with dark brown or almost black gills. Collected mushrooms are put in straw baskets. Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old (brown or almost black gills), maggoty fungi and the ones located close to motorways or junk yards.

Post-collection treatment: This variety of fungi is used when it is fresh. It may be dried, brined, marinated and frozen.

Botanical Name: *Armillaria mellea*

English Name: Honey Mushroom



Variety description: Fruiting body contains cap and stalk. Hymenophore is made of gills and located on the under side of the cap.

Cap: 2 – 15 (18) cm wide, convex at first, then flattened, centrally depressed, yellow, ochre, tawny to dark brown. The middle part is darker. The cap is covered with dark fibrillose scales, which disappear with the time.

Gills: White at first, then ochre, in the end reddish-brown or spotty dark, dense.

Stalk: 6 – 15 cm tall, 0,5 / 1,5 cm wide, tapering towards the base. On the stalk there is a ring which is solid, leathery, rather thick, upper surface is white and wrinkled, lower one is yellowish. Above the ring, the stalk is wrinkled and pinkish, below the stalk it is brownish with scales.

Flesh: White, in the stalk it is hard and fibrillose.

Habitat: Around trees and on logs of deciduous trees (especially oaks and beech-tree). It parasitizes on living trunks, on their remains it is saprobic. Fruiting bodies cluster, they rarely grow individually.

Similar and related varieties:

1. *Armillaria tabescens* has no ring on the stalk. **Inedible!**
2. *Hypholoma fasciculare* has gills of different colour (gills are sulphur yellow at first, then greenish-yellow, olive green and in the end grey-brown). Its taste is bitter and it has extremely delicate ring (like thin membrane), which is transient, it sticks to the stalk very soon and then disappears. **Poisonous variety!**

Also similar to *Armillaria mellea* are *Armillaria cepistalks*, *Armillaria gallica* and *Armillaria ostoyae*. **All these varieties are conditionally edible (like *Armillaria mellea*) and they may be collected for commercial purposes.**

A. borealis on the edge of a cap has no hair, it has lines (10mm) (stretch marks).

A. cepistalks has transient ring, with no hairs on the cap.

A. ostoyae grows only in coniferous forests of higher regions, the cap is darker with hairs clustered in concentric circles.

Parts collected: Fruiting bodies

Collection time: August – November

Collection tools: Scissors and knives

Method of collection: It is rather difficult to collect *Armillaria mellea* by twisting, since it has a woody stalk. It has to be cut with a scissors or a knife (higher up). Young and healthy caps are collected. Collected fungi are put in straw baskets. **Leave untouched at least 20% of fungi at the location of collection. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old and maggoty mushrooms and the ones located close to motorways or junk yards.**

Post collection treatment: It is good for brining, freezing and marinating. It is a conditionally edible fungus and therefore needs to be cooked for 15-20 minutes before consumption.

Botanical Name: **Boletus edulis**

English Name: **King Bolete**

Variety

description:

Fruiting body contains a cap and a stalk. Hymenophore that contains tubes is located on the under side of the cap.



Cap: 5 – 30 cm wide or bigger, semi spherical at first, than convex and in the end flattened, never concave. The surface is shiny, a bit sticky. Colours range from beige, orange-red, pink up to chestnut or even darker.

Gills: 8 – 30 mm long, they look like spongy tissue, make a ditch around the stalk, easily separable from the flesh of a cap. During the process of growing the tubes change their colour, they are white at first, than yellow and finally green. Tubes end with **pores** (small openings) are of a same colour, they stay plugged for long, round or angular. Tubes and pores do not change their colour when hurt.

Stalk: 5 – 20 cm high, 2 – 7 cm wide, like barrel, than cylindrical, solid, white to light brown with whitish net which is particularly visible in the upper part of the stalk.

Flesh: Hard, when older it turns softer, white to whitish, pleasant smell (like nuts), typical taste. Does not change colour when cut. Habitat: it grows in forests in mycorrhiza with trees. Fruiting bodies occur on the surface of the ground, individually or in groups.

Similar and related varieties: *Boletus* group includes about 20 varieties. *Boletus edulis*, *Boletus pinophilus* and *Boletus reticulatus* in Serbia and *Boletus aereus*. *Botulis edulis* can be mistaken for these varieties. All of them

have tubes and pored that are white at first, than yellow and green in the end: they have white net and do not change colour when touched. The differences are as follows:

- *Boletus aereus* has a cap which is almost black to chocolate-brown colour, it grows in oak and chestnut woods. **It is on the European Red List. It is in the process of being protected in Montenegro and it should not be collected!**
- *Boletus pinophilus* has a cap which is red-brown or chestnut colour, the colour of the edge of a cap is lighter. It grows under pines mainly.
- *Boletus reticulates* lives in deciduous forests, its cap is of a lighter colour with whitish edge. When the weather is dry, the cap turns into small scales.



Parts collected: Fruiting bodies

Time of collection: June – November

Collection tools: Manual collection

Method of collection: It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalk. Mushrooms with white pores and 4 – 8 cm wide caps are highly in demand. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old (brown or almost black gills), maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are used when fresh. They may be dried, marinated and frozen.

Botanical Name: *Bovista plumbea* Pers.
English Name: Grey Puffball



Variety description: Fruiting body is round, 1,5 – 4 cm wide, with no stalk but a root-like extension. It contains two veils, inner and outer. Outer veil is whitish and smooth. It disappears as the fungus gets older (it peels off like the egg shell). Only inner veil remains, greyish and crispy. Soon it breaks at the top with a little hole.

Flesh: Located inside of the fruiting body and it is wrapped in veils. Flesh of immature fruiting bodies is solid and white. Later on it turns yellowish and in the end, when the spores are ripe, dark brown.

Habitat: It grows on fields and pastures. Fruiting bodies occur on the surface of the ground, usually in small groups.

Similar and related varieties:

- 1. DEADLY POISONOUS varieties of *Amanita* when their fruiting bodies are very young. In this stage they are wrapped in universal veil and have a shape of an egg.** However, even at that stage, cross section shows a fruiting body

which is divided into a cap and a stalk. During the sudden growth of a fruiting body of this variety, the veil breaks and its traces remain on the surface of a cap in form of rags, grains and, at the base of a stalk, volva.

2. *Bovista nigrescens*: its inner veil has a different colour (in the beginning it is greyish, than brown and black in the end). It grows on mountain pastures and fields. **This variety is edible and commercial.**

Parts collected: Fruiting bodies

Collection time: June – November

Collection tools: Manual collection only

Method of collection: Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect immature fruiting bodies (fungi with white and solid flesh). Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 1.5cm), or old (brown or almost black gills), maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are used when fresh. They may be brined, marinated and frozen. They are seldom dried.



Botanical Name: *Cantarellus cibarius* Fr.

English Name: Chanterelle



Variety description: Fruiting body contains a cap and a stalk. Hymenophore is located on the under side of a cap. Hymenophore is made of thin lamellas.

Cap: 3-12 cm wide. Convex while the fungus is immature, later of more concave with very irregular wavy edge, light yellow to orange yellow. The surface is dry, with no shine.

Thin lamellas: This variety has no proper gills, but so called thin lamellas that resemble gills. Thin lamellas have dull and rounded edge (unlike gills, they do not have sharp edge), they are very thin, up to 3 mm wide, extremely split. Their colour is lighter than the colour of cap. They go long way down the stalk.

Stalk: 2-3 cm tall, 0,5 – 1 cm wide, it is cylindrical or more narrow towards the base. Stalk is full (it is not hollow), its surface is more or less smooth, dry, its colour is the same like the cap or a little lighter.

Flesh: Solid, whitish to yellowish, smells pleasantly (like peaches), its taste is mild to mildly hot.

Habitat: This variety grows in deciduous and coniferous forests, in mycorrhiza. Fruiting bodies occur on the surface of the ground, most often in groups, seldom single.

Similar and related varieties:

1. *Omphalotus oleasius* has proper gills, 4-9 mm wide, straight, with sharp edge. It is larger and darker. Fruiting bodies occur in lower grounds on logs, along the base of tree trunks (oak, chestnut, beech-tree, olive), and not out of the ground like the fruiting bodies of *Cantharellus cibarius* Fr. do. They usually grow in clusters. **Poisonous variety!**

2. *Hygrophoropsis aurantiaca* proper gills and it is not mycorrhiza. **Poisonous variety!**

3. *Cantharellus cibarius* var. *amethysteus* has tiny violet scales on the surface of a cap and lives in coniferous forests. Rare variety!

4. *Cantharellus friesii* thin lamellas are pink to orange (not yellow), cap and stalk are living orange. When mature, a cap is 1-4 cm wide. Rare variety!

Parts collected: Only fruiting bodies are collected.

Collection time: June – November

Collection tools: Manual collection only

Method of collection: Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalks. Fungi with caps that exceed 3 cm in diameter are especially in demand (extra class). Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are used when fresh or brined, marinated and frozen. They are seldom dried.

Botanical Name: *Craterellus cornucopioides*

**English Name: Black Trumpet;
Horn of Plenty**



Variety description: Fruiting body has a shape of a deep funnel with in rolled, wavy edge. Hollow space goes down to the bottom of the fruiting body, therefore it resembles a trumpet or a horn. When mature, fruiting body is 3-8 cm wide, 5-12 cm tall, its inner surface is grey-brown, black-brown or almost black, with tiny scales.

Hymenophore: Made of outer surface of fruiting body; it is wavy or wrinkled, seldom completely smooth, with no gills or thin lamellas, velvety, bare, colour is grey to bluish or violet-grey.

Flesh: Thin, 1-2 mm thick, relatively elastic, dark grey, pleasant smell, sweet taste.

Habitat: It grows in deciduous, mixed and seldom coniferous forests, in mycorrhiza with trees. Fruiting bodies occur on the surface of the ground in groups.

Similar and related varieties:

1. *Cantharellus cinereus* differs from *Craterellus cornucopioides* by the hymenophore which is made of thin, split lamellas: its edge is dull. Hymenophore of *Craterellus cornucopioides* is almost smooth or more often mildly wrinkled,

but it never has gills or thin lamellas. **Rare variety!**

2. *Pseudocraterellus undulates* it has an in-rolled cap but no hole. The colour is lighter. **Rare variety!**

Parts collected:

Only fruiting bodies are collected.

Collection time:

August – November

Collection tools:

Scissors and knives

Method of

collection: It is

difficult to collect them by twisting because they break easily. They need to be cut with scissors or knives close to the ground. We collect healthy fungi with stalks. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped or old, maggoty fungi and the ones located close to motorways or junk yards.**



Post collection treatment: They are dried in the sun or in dryers. Whole mushrooms are dried. Before drying, they need to be cleaned with brush (seldom washed). When drying is performed in the sun, they are put on aluminium or polyvinyl nets (diameter of the holes need to be 5mm), exposed to the sun or dry place until the process of drying is completed. If drying is not completed in the course of one day, take them inside or cover them overnight because of the dew. Dried fungi are not too fragile and their colour is grey. Badly dried mushrooms are black, sticky and elastic (second class). They are packed into glass jars or nylon bags. Out of one kilo of fresh fungi we may get 110 to 120 gr. of dried fungi. Dried *Craterellus cornucopioides* can be grinded into powder and used as spice.

Botanical Name: Hydnum repandum L.

English Name: Hedgehog Mushroom



Variety description:

Fruiting body contains a cap and a stalk. Hymenophore is located on the underside of a cap. It is made of spines.

Cap: 5-15 cm wide, in the beginning convex, than flattened, with wavy or lifted edge, light or dark yellow colour, later on lighter, up to dirty white. Surface is velvety.

Spines: Different length, crowded, in the beginning whitish, than yellowish; they go down the stalk; fragile.

Stalk: Short, solid, full, cylindrical, smooth: colour is the same as a cap, or a little lighter; 5 – 8 cm long, 1 – 3 cm wide, often eccentric.

Flesh: Fragile, light yellow, pleasant smell and taste; spines are bitter; old fruiting bodies are bitter.

Habitat: Deciduous and coniferous forests; Fruiting bodies occur in groups, seldom single.

Similar and related varieties:

1. *Hydnum repandum*, var. *amarum*: bitter from the beginning, not just spines but the whole.

Inedible!

2. *Albatrellus confluens*: on the under side of the cap there are no spines, but holes.

Hydnum rufescens is very similar to *Hydnum repandum*. It is smaller, the cap is 3 – 6 cm wide, the colour is red-yellowish, stalk has no spines. **Edible and commercial variety.**

Pats collected: Fruiting bodies

Collection time: August – November.

Collection tools: Manual collection only

Method of collection: It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with stalks. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are good for drying, brining, marinating and freezing. Before the treatment we need to remove the spines from the cap and cook the fruiting bodies.



Botanical Name: *Hydnum rufescens* Fr.

English Name: Terracotta Hedgehog



Variety description: Fruiting body contains a cap and a stalk. Hymenophore is located on the underside of a cap. It is made of spines.

Cap: 3-6 cm wide, in the beginning convex, than flattened, sometimes concave in the middle, reddish and yellow in the beginning later a little whiter; wavy edge; velvety surface.

Spines: Short, different length; reddish-yellow, lighter than the cap; coming to the stalk but do not go down it; fragile.

Stalk: Short, relatively thin, 2,5 – 6 cm long, 1 – 3 cm wide, cylindrical, full, smooth, often eccentric.

Flesh: Soft in the beginning, than solid: pale yellow colour; pleasant smell and taste, only spines are bitter; old fruiting bodies are bitter.

Habitat: Deciduous and coniferous forests. Fruiting bodies occur in groups, seldom single.

Similar and related varieties:

1. *Hydnum repandum*, var. *amarum*: bitter from the beginning, not just spines but the whole. **Inedible!**

2. *Albatrellus confluens*: on the under side of the cap there are no spines, but holes.

Hydnum repandum is very similar to *Hydnum rufescens*. It is bigger, the cap is pale to tawny yellow, the spine go down the stalk a little.

Edible and commercial variety.

Parts collected: Fruiting bodies

Collection time: August – November

Collection tools: Manual collection only

Method of collection: It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalks. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are good for drying, brining, marinating and freezing. Before the treatment we need to remove the spines from the cap and cook the fruiting bodies.



Botanical Name: **Lactarius deliciosus**
(L. Fr.) Gray

English Name: **Saffron Milkcap**



Variety description: Fruiting body contains cap and stalk. Hymenophore is made of gills and located on the under side of the cap.

Cap: 5 – 15 cm wide, convex at first, than funnel shaped, in-rolled edges; the surface is covered with a thin, sticky layer when the weather is wet. The cap is of light orange-pink colour, with concentric zones. The cap may be greenish as well, mainly on the edges. The zones may appear in the shape of darker spots, without characteristic glow.

Gills: Crowded, going downwards or grown together with the stalk; they turn green when pressed; when injured they produce orange juice (like carrots) which slowly turns green.

Stalk: 3 – 7 cm tall, 1,5 / 2,5 cm wide, cylindrical, thinner towards the bottom, orange, with shallow, sharp-edged round or oval pits.

Flesh: Whitish beige (yellowish in the cap); produces orange milk (like carrots) that turns

gray-green when exposed to the air for some time; taste is a little bitter; smells like fruits.

Habitat: It grows in coniferous forests, usually under pine trees, often in areas rich in limestone.

Similar and related varieties:

This variety may be mistaken for some other varieties that produce orange or red milk:

Lactarius sanguifluus, *Lactarius semisanguifluus*, *Lactarius deterrimus* and *Lactarius salmonicolor*. However, only *Lactarius deliciosus* has shallow, sharp edged round or oval orange pits on its stalk. **All these varieties are edible and commercial.**

Parts that are collected: Fruiting bodies

Collection time: From June to late autumn

Collection tools: Manual collection only

Method of collection: Fruiting bodies are very fragile, especially the edges of the cap, therefore they need to be collected very carefully. It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi, together with stalks. Collected mushrooms are put in straw baskets. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 4cm), or old and maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: It is used fresh, brined and marinated. It may be frozen. It is never dried. Fresh samples are packed in crates (in no more than two levels) and transported in cold storages (+4°C).

Botanical Name: *Lactarius deterrimus*

English Name: False Saffron Milkcap



Variety description: Fruiting body contains cap and stalk. Hymenophore is made of gills and located on the under side of the cap.

Cap: 5 – 11 cm wide, convex at first, in rolled edge; orange in the beginning, with green spots or, even more often, concentric circles. The surface is sticky when the weather is wet.

Gills: Crowded, of different length; grow along the stalk; orange in the beginning, later develop green patches; when injured they produce orange liquid.

Stalk: 3 – 7 cm tall, 1,5 / 2,5 cm wide, orange-whitish; cylindrical; fragile; sometimes with a shallow pit that is darker.

Flesh: Whitish beige (yellowish in the cap); produces orange milk that turns grey-green when exposed to the air for about 30 minutes; taste is a little bitter; smells like fruiting.

Habitat: It grows in fir forests and under pine trees.

Similar and related varieties:

1. *Lactarius sanguifluus*: it grows under pine trees; milk is intensively red from the very beginning. Its hat is orange, with more or less concentric circles.

2. *Lactarius semisanguifluus*: it grows under pine trees; cap is grey-green (a shade or orange when immature). Later on the green colour starts to dominate, particularly on the stalk.

3. *Lactarius salmonicolor*: it grows under pine spruces, has no traces of green or blue-green colour on fruiting body; it is orange.

4. *Lactarius deliciosus* grows under pines, on its stalk there are shallow, sharp edged round or oval orange pits. **All these varieties are edible and commercial.**

Parts collected: Fruiting bodies

Collection time: Autumn

Collection tools: Manual collection only

Method of collection: Fruiting bodies are very fragile, especially the edge of the cap, therefore they need to be collected very carefully. It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalks. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 4cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post-collection treatment: It is used fresh, brined and marinated. It may be frozen. It is never dried. Fresh mushrooms are packed in crates (in no more than two levels) and transported in cold storages (+4°C).



Botanical Name: Marasmius oreades

English Name: Fairy Ring Mushroom



Variety description: Fruiting body contains cap and stalk. Hymenophore is made of gills and located on the under side of the cap.

Cap: 2 – 5 cm wide, convex at first, then flat, with or without protuberance in the middle; in wet weather the edge looks wrinkled and it is yellowish-brown, but as it dries it becomes pale ochre.

Gills: White or ochre yellow, distant, free (they do not stick to the stalk).

Stalk: 2 – 10 cm tall, 0,3 / 0,5 cm wide, slender and equal (slightly curved on older mushrooms), elastic, full, its bottom is covered with cotton-like matter, whitish to yellow-brown colour.

Flesh: Whitish, thin, elastic, smells like fresh wood chip.

Habitat: It grows in glades, pastures and fields. Fruiting bodies very often form circles.

Similar and related varieties:

1. *Clitocybe dealbata*: it grows on meadows, edges of forests. Fruiting bodies are whitish, sometimes with brownish patches; its gills are more crowded and go down the stalk a little.

Deadly poisonous!

2. *Marasmius collinus*: it grows in the same places; its stalk is hollow and fragile. **Causes mild digestive problems.**

3. *Lactarius salmonicolor*: it grows under pine spruces, has no traces of green or blue-green colour on fruiting body; it is orange.

4. Poisonous varieties of *Inocybe family* have cleft caps.

Parts collected: Cap and stalk (1 cm).

Collection time: May - November.

Collection tools: Scissors and knives

Method of collection: They are very difficult to collect by twisting, therefore they are cut with scissors or knives, a little above the end of a stalk. Fruiting bodies are present in nature for a long period of time, we can often find them in dry condition (during warm days). Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: They are dried in the sun or in dryers. They are small and therefore don't need to be cut.



Botanical Name: *Morchella conica*
Morchella elata Pers.

English Name: Morel



Variety description: Fruiting body contains a cap and a stalk.

Cap: 3 – 10 cm tall, 2 – 5 cm wide, oval, its top is dull. From the top of the cap towards the bottom there are ridges that form pits, the whole surface looks like a honeycomb. Ridges are grey to black-brown and the pits are paler. Oval membrane connects the cap to the stalk.

Stalk: 2–6 cm tall, 2-3 cm wide; cylindrical; dirty white colour; slightly wrinkled and grainy. A cap and a stalk are hollow.

Flesh: Thin, cartilaginous, whitish, it has no smell, its taste is mild.

Habitat: It grows in deciduous and coniferous forests, along forest roads, on various remnants

(rotten apples, cardboard boxes etc.) Fruiting bodies grow in smaller groups, seldom single.

Similar and related varieties:

1. *Gyromitra esculenta*: it has no obvious ridges that form pits on a cap, it has tightly crowded canals that look like a surface of a human brain.

Poisonous variety!

2. *Morchella elata*: its cap and stalk have equal width (especially at the point of attachment). It is less appreciated in the market due to its very thin flesh.

3. *Mitrophora*: the edge of its cap is free.

4. *Verpa conica*: its cap is attached to the stalk at the centre, the remaining part is pending around the stalk like a bell. The surface is wrinkled, but it does not form honeycomb pits.

Parts collected: Fruiting bodies

Collection time: Depending on the altitude, from the middle of March to the end of May.

Collection tools: Manual collection only

Method of collection: Fruiting bodies are very fragile, especially the edge of the cap, therefore they need to be collected very carefully. It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalks. Mushrooms with caps that are not taller than 3-4 cm are particularly appreciated. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post-collection treatment: Fruiting bodies are mainly dried.

Botanical Name: **Morchella esculenta**

English Name: **Yellow Morel**
White Morel



Variety description: Fruiting body contains a cap and a stalk.

Cap: 4–12 cm tall, 4–8 cm wide, oval. From the top of the cap towards the bottom there are ridges that form pits, the whole surface looks like a honeycomb. Ridges are different shades of ochre and brown and the pits are paler. Cap and stalk are completely joined.

Stalk: 3–8 cm tall, 1.5-3 cm wide; dirty white to light yellow; wrinkled and grainy; wider towards the base. A cap and a stalk are hollow.

Flesh: Cartilaginous, whitish to light pink colour, smells like fungi, its taste is mild.

Habitat: It grows on sandy or clay grounds, in open spaces (fields, meadows, pasture) or in deciduous forests (poplar, oak). Fruiting bodies grow in smaller groups, seldom single.

Similar and related varieties:

It cannot be mistaken for some other variety. The light colour of its cap (ochre or light brown)

and the surface that resembles a honeycomb make it highly recognizable.

Parts collected: Fruiting bodies

Collection time: Depending on the altitude, from the middle of March to the end of May

Collection tools: Manual collection only

Method of collection: It is collected by twisting in order not to damage the mycelium. Twist them slowly and take them carefully out of the soil. Cover the area where the fruiting body was collected with substrate. Collect healthy fungi with whole stalks. Mushrooms with caps that are not taller than 3-4 cm are particularly appreciated. Straw baskets are used for collection. **Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 2cm), or old, maggoty fungi and the ones located close to motorways or junk yards.**

Post collection treatment: Fruiting bodies are mainly dried. First clean them and then dry them in the sun or in dryers.



Botanical Name: Pleurotus ostreatus

English Name: Oyster Mushroom



Variety description: Fruiting body contains cap and stalk (sometimes it has no stalk). Hymenophore is made of gills and located on the under side of the cap.

Cap: 6–15 cm wide, convex at first, than flat, with in rolled and wavy edge; most often grey-brown, sometimes grey-bluish.

Gills: Go down the stalk; in the beginning white, than with a shade of yellow; crowded, fragile and of many different lengths.

Stalk: Short, 1–2 cm tall, eccentric (usually aside), whitish with woolly base, solid, full, cylindrical, smooth, colour the same as a cap or a little lighter. Sometimes there is no stalk.

Flesh: Solid, fragile, white, pleasant smell and taste.

Habitat: It grows on logs and laying trunks of deciduous trees, most often beech-trees.

Similar and related varieties:

1. *Pleurotus pulmonarius*: its cap is fan-shaped, white or beige. Fruiting bodies occur from September to December, on deciduous trees.

Edible variety!

2. *Sarcomyxa serotina*: its stalk is yellow with brown spots, gills also have shades of ochre. Fruiting bodies occur in winter on deciduous trees.

3. *Lentinus torulosus*: its cap is pink-lilac in the beginning and later on it is pale ochre and yellow-brown. Stalk and cap are of a same colour.

Parts collected: Fruiting bodies

Collection time: During whole year. However, the largest numbers of fruiting bodies occur from June to September

Collection tools: Knife (seldom manually)

Method of collection: They are carefully cut with knives, from the crust of the tree in order not to hurt the crust. Collect healthy mushrooms with stalks. Collected fungi are put in straw baskets.

Leave at least 20% of fungi untouched at the location of collection. Fruiting bodies must not be picked or cut with a knife. Do not collect immature, undeveloped (diameter of a cap up to 4cm), or old, maggoty fungi and the ones located close to motorways or junk yards. It is forbidden to damage the crust of the tree from which the fungi are collected.

Post collection treatment: They are used fresh, dried, brined, marinated and frozen. Fresh mushrooms are packed in crates, in no more than two levels and then transported in cold storages (+4°C). Other possible processing steps are presented in the chapter on conservation.

