

The Food of the Gods in the Empire of Man

Mushrooms and their use in everyday life and medicine in classical antiquity

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In antiquity, references to a very specific type of food began to appear for the first time in literary works. This food had already been noticed by the Greeks, who remained very skeptical about its consumption. The Romans, on the contrary, highly valued it. It became very popular, especially with the wealthy class of Roman society. This food changed history at least once – when it became the tool for the murder of Emperor Claudius. And while Emperor Tiberius paid 200,000 sesterces to establish whether or not this was the best type of food, the Roman intelligent class warned ordinary people about it. We are talking about mushrooms, the food of the gods.

Keywords: Classical antiquity; mushrooms; medicine; diet; poisoning; toadstool; boletus; fungi; suillus; truffles.

Mycophiles and mycophobes

Although people have been familiar with mushrooms since prehistoric times, the first brief references to them only occur in the 5th century BC in *Epidemicorum*, part of collection *Corpus Hippocraticum* (Hipp., *Epid.* VII, 102). They are described in more detail by Theophrastus of Eresos, a philosopher and founder of botany living at the turn of the 4th and 3rd century BC. In his ten-part study, *Περὶ φυτῶν ἱστορία* (Latin *Historia Plantarum*), he categorized them as plants, which did not change until the invention of the microscope in the 19th century. Theophrastus considered mushrooms to be an exception to the vegetable kingdom because they exist without characteristic organs such as roots, flowers, leaves, fruit or bark (Theoph., *Hist. Plant.*, I, 1.11).

At the beginning of the 2nd century BC, a new phenomenon called mycophobia appeared. The first person to signify it was the poet and physician Nikandros of Colophon. In his toxicological handbook, *Alexipharmaca*, he comments in a negative way about mushrooms. He calls them “the repulsive ferment of the earth,” claiming that “they cause health problems just to annoy man” (Nic., *Alexiph.*, 521–522). This approach was adopted by later authors and became very popular, especially in Roman works.

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A very mycophobic attitude was taken by the naturalist Pliny the Elder in his encyclopedic series *Naturalis Historia*, where he devoted three chapters to mushrooms (Plin., *NH.* XIX, 11; XXII, 46, 47)². This author is also the main source of our knowledge of mushrooms from the period of the Roman Empire. His opinion was strongly influenced by older authors from whom he uncritically took up many myths and superstitions. The doctor Claudius Galenus was even more negative about mushrooms in his work *De Alimentorum Facultatibus*, in which he urges people to stay away from them and not to eat them, because all kinds of fungi indiscriminately cause health problems. He disgustedly added that “mushrooms, of all kinds of food, have the coldest, slimiest and thickest juice” (Gal., *De Alim. Facult.* II, 69).

In many cases, such hostility is understandable. For example, the Greek poet Euripides wrote about the oldest known case of poisoning in which a mother of three children died (Ath., *Deipn.* II, 61A). Cicero, in his letter to Marcus Fadius Gallus, complained that although he was not sick of oysters, mushrooms gave him stomach problems (Cic., *Ad Fam.* VII, 26). Plutarch condemned mushrooms because he believed they are an unnecessary whim and people consume them only because they are expensive (Plut., *De Tuen. San. Prae.* VI). Likewise, Juvenalis considered them as one of the pieces of evidence of Roman vanity and gluttony (Juv., *Sat.* XIV).

Mushrooms are mentioned by many other ancient figures: Dioscorides (Diosc., *De Mat. Med.* II, 175; III, 1; IV, 83)³ and Ovid (Ov., *Fast.* IV, 697), Horace (Hor., *Epis.* I, 9.5–6), Seneca (Sen., *Quest. Nat.* IV, 13.9), Petronius (Petron., *Sat.* 38, 109), (Sat. Martialis (Mar., *Ep.* I, 20; III, 45, 60; VII, 20, 78; XI, 18, 31; XII, 17, 48; XIII, 48, 50; XIV, 101)⁴ and Suetonius (Suet., *De Vit. Caes.* III, 42; V, 44), Celsus (Cels., *De Med.* V, 27.17) and Athenaeus of Naucratis (Ath., *Deipn.* II, 60.B–62.D). The cookbook *De Re Coquinaria*, known especially under its eponym *Apicius*, is irreplaceable due to it being a valuable source of contemporary recipes (**Fig. 1**). Its author believed to be Marcus Gavius Apicius, is one of the rare examples of an ancient mycophile. Another mycophiles we know mostly from epigrams of Martialis and work of Suetonius. The latter mentions examples of mycophiles in the Julio-Claudian dynasty, emperors Tiberius (Suet., *De Vit. Caes.* III, 42) and Claudius (Suet., *De Vit. Caes.* V, 44).

² Other information are mentioned by Pliny in short chapters (Plin., *Nat. Hist.* XIX, 12, 13, 14; XXV, 57) and notices (Plin., *Nat. Hist.* XIII, 50; XIV, 8, 13, 35, 77, 96). Chapters mentioning *agaricum* as part of method of medical treatment are not included in the list.

³ Secondary notices in Diosc., *De Mat. Med.* I, 109, 168; II, 98, 137; III, 26, 118; IV, 84, 108; V, 11, 21, 114, 126, 131, 135, 136, 142.

⁴ Also supposititious epigram XXII *To Macrinus*: „You used to say, Macrinus, that men never died of mushrooms. But mushrooms have at last been the cause of your death.“

The youngest and equally valuable is the *Geoponica*, a Byzantine collection of ancient works about agriculture, compiled in the 10th century. Its main source is Pliny the Elder and, in addition to dealing with antidotes and the prevention of fungal poisoning, it also mentions otherwise unexemplified method of mushroom growing. Remarkably, Roman authors dealing primarily with agriculture (e.g. Cato and Columella) do not mention fungi at all.

The mushroom guide of antiquity

Ancient man, usually living in the countryside, undoubtedly came into contact with mushrooms throughout his whole life. Although he may have initially had one common name for them, over time he assigned individual names to each species he recognized.

In the Greek world, they recognized fungi under the term *mykés* (μύκης). Hippocrates (Hipp., *Epid.* VII, 102) and Euripides (Ath., *Deipn.* II, 61B), and later Theophrastus (Theoph., *Hist. Plant.* I, 1.11, 5.3, 6.5; *De Od.* I, 3), Nikandros (Nic., *Alexiph.* 521–538)⁵ and Dioscorides (Diosc., *De Mat. Med.* IV, 83), used this term for them in the 5th century. This term did not change, even during later periods. In Latin literature there is a different term – *fungus*. It is quite rare in the singular, and the most common form is the plural *fungi*. This term, like *mykés*, is a general name for mushrooms and does not refer to any particular species. However, this can be done by adding an adjective that specifies a substantial detail or feature characteristic for a particular mushroom species. We can use *fungi farnei* as an example, which only appears in Apicius (Apic., *De Re Coq.* VII, 15). The term “*farnei*” may be etymologically related to “*fraxinei*”, which would refer to mushrooms growing next to ash trees (Houghton 1885, 47)⁶. The most famous and the best kind, growing close to these trees, is the common morel (*Morchella esculenta*) (**Fig. 2**). Currently, this interpretation is generally accepted, and in *De Re Coquinaria* translations from J. D. Vehling and later, *fungi farnei* are translated as morels.

On the contrary, there are collocations that are unlikely to refer to a particular type of a mushroom. Among them is Ovid’s *fungos albos*, literally meaning “white

⁵ Athenaios also quotes the Nikandros’ lost work *Georgica* (Ath., *Deipn.* II, 60F; IX, 372E).

⁶ The study of W. M. A. Houghton from 1885 appears to be most influential of all for later authors. Number of them accepted his opinion without further critical study (for example Rolfe, Rolfe 1925). Some of the opinions appear to be outperformed, but as D. Benjamin says „it would take the persistence of another classical scholar to discover if he missed or misrepresented anything“ (Benjamin 1995, 30. Jaeger 2011, 15).

mushrooms” (Ov., *Fast.* IV, 697). Although within the context it can be merely identified as the field mushroom (*Agaricus campestris*), it is unlikely to be used as a common name. Several other types of mushrooms documented by the Romans were known under the similar description.

In addition to *mykés* and *fungi*, we have preserved many specific terms. One of the oldest is *pezis* (πέζις), referred to by Theophrastus when he mentions it along with truffles and *mykés* as being rootless plants (Theoph., *Hist. Plant.* I, 6.5). Houghton (Houghton 1885, 35) and his contemporaries assumed it is the mosaic puffball (*Handkea utriformis*) or another kind of puffball (*Bovista sp.*). However, this interpretation relies on Athenaeus’ (Ath., *Deipn.* II, 61E) and Pliny’s (Plin., *NH.* XIX, 14) transcripts of Theophrastus’ work. They contain information (e.g. the absence of stipe or the smooth surface of the pileus), which are not mentioned in the original. However, most modern authors, despite the contradictory sources, continue to consider *pezicae* as puffballs (Dugan 2008, 20; Rogers 2012, 77; Kiple – Ornelas 2000, 316. Also Merriam-Webster Dictionary, see notes for an etymology of the word “pezograph” (Pezograph)).

A little clearer is the *agarikon* (ἀγαρικόν), which was first mentioned by Dioscorides (Diosc., *De Mat. Med.* III, 1). Pliny very often writes about it under the term *agaricum* (Plin., *NH.* XIII, 57). They both describe it as a mushroom that grows abundantly on trees in different Mediterranean territories, usually in Anatolia and the Gallic provinces. It got its name after the cape Agarum in the Black Sea Sarmatia, which Dioscorides also mentions in connection with its occurrence (Diosc., *De Mat. Med.* III, 1). Because of its significant use in ancient medicine, this term is usually interpreted as quinine conk (*Laricifomes officinalis*), but we can assume that it could have referred to several species of Polyporales mushrooms.

Both *Pezicae* and *Agaricum* are Latinized Greek names. A different case is *boletus*, which first appears in the 1st century AD in the writings of Pliny (Plin., *NH.* XXII, 46), Seneca (Sen., *Quest. Nat.* IV, 13.9) and Petronius (Petron., *Sat.* 38), and later in the Greek form *bolités* (βολίτης) at Galen (Gal., *De Alim. Facult.* II, 69). It was mentioned multiple times by Martialis (Mar., *Ep.* III, 60; XII, 48; XIV, 101), Apicius mentioned it in several recipes (Ap., *De Re Coq.* VII, 15) and Juvenalis mentioned it once briefly (Juv., *Sat.* XIV.8). Thanks to Pliny’s description, we can safely claim that it is primarily a Caesar’s mushroom (*Amanita caesarea*), which became a highly valued type of food in the Roman environment (**Fig 3**). However, he also mentions poisonous kinds, so *boletus* may have represented toadstools in general (Plin., *NH.* XXII, 46).

The mushrooms that are very popular these days in the Central and Eastern Europe area were known by the Romans under the name *suillus*. This name is first mentioned by Pliny (Plin., *NH.* XXII, 47). Pliny’s description of *suilli* is quite confusing but contains some crucial information. However, the most important clue is the etymology. The basis of the word points to the association with swine

(*sus* = pig; *suillus* = swine, belonging to swine). Today in Italy, the term *porcino* (i.e. “swine fungi”) refers to penny buns (*Boletus edulis*) and *porcinello* refers to scaber stalks (*Leccinum scabrum*) (Houghton 1885, 32), both of which match Pliny’s descriptions. However, it should be kept in mind that *suillus* probably served to designate several kinds of mushrooms of genus *Boletus*, not just penny buns.

Ancient authors paid a great deal of attention to truffles. These, like *mykés* and *agarikon*, are mentioned by Theophrastus under several names (Theoph., *Hist. Plant.* I, 1.11). The basic term was *hydnon* (ὑδνον). This word is also briefly mentioned by Dioscorides (Diosc., *De Mat. Med.* II, 175); however, Galen (Gal., *De Alim. Facult.* II, 68), Plutarch (Plut., *Symp.* IV, 2) and Athenaeus (Ath., *Deipn.* II, 62A–D) mentioned it more often. There is no doubt that these preserved descriptions are of truffles. The Roman equivalent of the word *hydnon* is *tuber* (plural *tubera*), sometimes used in its extended form of *tubera terrae*.

Other names alternately appear to have been used by Theophrastus, Pliny and Athenaeus. Theophrastus first mentioned the names *keranion* (κεράνιον), *iton* (ἶτον) and *aschion* (ἀσχίον) (Theoph., *Hist. Plant.* I 6.5).⁷ He claimed that *aschion* (Theoph., *Hist. Plant.* I, 6.9) and *geraneion* are synonyms of the word *hydnon*, while *iton* is a Thracian name (Theoph., *Hist. Plant.* I, 6.13). With Athenaeus, *geraneion* appears in the altered form of *geraneion* (γεράνειον) (Ath., *Deipn.* II, 62A) and with Pliny as *geranion* (Plin., *NH.* XIX, 12). The etymology of all three versions is clearly derived from the word *keranos* (κεράνος), or “storm”, which is undoubtedly related to the myths about the origin of truffles.

Pliny, however, considers *iton* and *geranion* to be synonyms of another species (Plin., *NH.* XIX, 12), which Theophrastus calls *misý* (μίσην). According to Pliny’s description in a separate short chapter, it seems to be most likely that they are fruiting bodies of the genus *Terfezia* (*Terfezia* sp.), also referred to as false or desert truffles.

Many other very unclear names appear in ancient literature, but they are virtually impossible to identify due to the absence of any descriptions or context. One of them is the *helvella* which Cicero mentions, along with mushrooms and truffles, as one of the “gifts of earth”, which was becoming more and more popular (Cic., *Ad Fam.* VII, 26). Others are *amanitai* (ἀμανίται), which Galen considers to be the second safest species, right after *boleti* (Gal., *De Alim. Facult.* II, 69). Athenaeus also briefly mentioned it (Ath., *Deipn.* II, 61A). It is a pity that there is no detailed description of it, as it could have been an important species in Greece. Houghton interprets it as meadow waxcap (*Cuphophyllus pratensis*), but this has no basis (Houghton 1885, 48).

⁷ Note: Once he also mentions with them ούίγγον (Theoph., *Hist. Plant.* I 6.9), but further explains that this plant also has leaves and its bulb is very tasty (Theoph., *Hist. Plant.* I 6.11), so it is certainly not a mushroom, but some kind of a root crop.

Snakes, storms and rusty nails

Ancient scientists made many relevant observations. For example, that some mushroom species grow on particular kinds of trees and that they appear more often after rain. Pliny even describes in detail the entire process of *boleti* growing (Plin., *NH.* XXII, 46). However, empirical experience was limited by technology, as many aspects of mushrooms are exclusively observable at a microscopic level. In such cases facts were replaced by folklore.

In antiquity, the idea that mushrooms grow from rotten, decomposed material prevailed. They called them the ferment of the earth. Dioscorides claimed that they cannot be stored because they already grow rotting (Diosc., *De Mat. Med.* IV, 83). Pliny mentioned that the fruiting body of *boleti* first appears in the form of a sticky foam before it becomes solid (Plin., *NH.* XXII, 46). It is possible that they considered mycelium as mold or rot since some authors emphasize that mushrooms are plants without roots (Theoph., *Hist. Plant.* I, 1.11, 6.5; Plin., *NH.* XIX, 14).

According to ancient authors, the poisonous character is not indicated by the type of mushroom, but the circumstances of its growth. Nikandros claims that poisonous mushrooms, “due to snakes’ poison and breath grow in the deep furrows after they slither there” (Nic., *Alexiph.*, 523–524). It is possible that Nikandros did not think of this explanation himself, but it had already been part of Greek folklore. The idea of snake poison affecting the mushrooms’ edibility continues later – according to Dioscorides, poisonous mushrooms grow close to snake burrows (Diosc., *De Mat. Med.* IV, 83).

This Greek superstition gradually got to the Romans, exclusively in connection with *boleti*. They already knew that young toadstools are initially wrapped in a universal veil that tears over time as the fruiting body gradually emerges. Pliny considered this moment decisive in determining whether the *boletus* would be edible or poisonous. He writes that “if there is a snake’s nest near them and the snake breathes on them as they open, and because they are naturally related to poisonous substances, they tend to absorb such poison” (Plin., *NH.* XXII, 46).

This tendency for the absorption of poisonous substances appears to be Pliny’s explanation of everything written about mushrooms by older authors. They claimed a variety of factors affected the toxicity of mushrooms. Dioscorides warns of mushrooms growing near rusty iron and rotten cloths. The toxicity was also believed to be affected by the trees near which the mushrooms grow. If their fruits are harmful, the mushrooms absorb their juice (Diosc., *De Mat. Med.* IV, 83).

Truffles were a big mystery, which seemingly randomly appeared anywhere under the ground. According to Theophrastus, they grow during the autumn rains. He mentions people, according to whom they reproduce with seeds, because in Mytilene on the island of Lesbos, they mainly appear after the floods when the water brings

them from the rivers down to the beach (Theoph., *Hist. Plant.* I, 6.13). However, he considers the main reason for their growth to be storms. This idea became an integral part of Greek folklore, as evidenced by one of the Greek names for truffles – *geraneion*.

The Romans took this superstition from Greeks. Pliny at first considered them to be clusters of earth and argued whether or not they are alive because they rot like wood (Plin., *NH.* XIX, 11). However, he added that they mostly grow in the autumn during the rains and storms because thunder is beneficial to their growth (Plin., *NH.* XIX, 13).

The food of the gods

The most important and most common way of using mushrooms was, of course, eating them. The rejective attitude of the Roman intelligent class had little influence on the whims of the wealthier part of society. Mushrooms became a form of presentation, and by serving them at receptions and banquets, hosts were not only able to show their wealth, but also their generosity. Martialis, in one of his epigrams, gives severe criticism of Caecilian, who at a banquet only served *boleti* to himself so the guests would have to look at him and watch him eat them (Mar., *Ep.* I, 20). Plutarch talks about the absurdity of indulging in some types of food and drink simply due to their high prices. As examples, he includes swine udders, Italian mushrooms, cakes from Samos and snow from Egypt (Plut., *De Tuen. San. Prae.* VI).

This trend was not present in Rome since its origin. In the Republican period, mushrooms did not receive any special attention. Cicero changed this when he wrote in a letter to Fadius Gallus that “the Epicurians are trying to popularize the fruits of the earth, which are not prohibited by law”, listing among them mushrooms (Cic., *Ad Fam.* VII, 26). The law is probably *Lex Aemilia sumptuaria* from 115 BC, which prohibits exceeding a certain financial limit when organizing banquets and explicitly forbids the consumption of certain luxurious ingredients such as mice, rats, dormice, mussels and exotic birds.⁸

Due to the ban on luxury food, wealthy Romans most likely began to look for new foods. The inspiration could have come from the countryside where mushrooms had been known for a long time. Perhaps that is why Pliny calls *boleti*

⁸ Note: Dating of *Lex Aemilia Sumptuaria* is questionable. Gellius accredits the introduction of this law to Marcus Aemilius Lepidus in 78 BC (Gell., *Noc. Att.* II, 24.). However, Pliny the Elder considers Aemilius Scaurus to be its author and dates it back to 115 BC (Plin., *Nat. Hist.* VIII, 82). It is possible that these are two interrelated laws adopted in both years.

and *suilli* “only recently discovered delicacies” (Plin., *NH.* XVI, 8). The law, which was supposed to prevent mammonism, was most likely one of the reasons behind the birth of Roman gluttony.

Over time, mushrooms became a very popular food. Some species were imported into Rome while others were exported. Plutarch, for example, mentioned that the Greeks were increasingly indulging in Italian mushrooms (Plut., *De Tuen. San. Prae.* VI). In the end, even the emperors themselves fell under their spell. Suetonius writes that the Emperor Tiberius entrusted a man named Asellius Sabinus with an unusual task – to write a dialogue in which *boleti*, *beccafici*⁹, thrushes and oysters competed for the right to be considered the best food by the emperor. He was allegedly rewarded with 200,000 sesterces (Suet., *De Vit. Caes.* III, 42).

A menu for those who are demanding

The Romans’ favorite mushrooms were *boleti*. Pliny the Elder mentioned them for the first time. He dedicated a whole chapter to them, describing the process of their growth and trying to distinguish the edible species from the poisonous ones (Plin., *NH.* XXII, 46). Based on its description, it can be quite reliably determined that the Romans knew the Caesar’s mushroom (*Amanita caesarea*) as *boletus* (Fig. 4). It is a thermophilic species characteristic of the Italian Peninsula that gradually disappears with increasing latitude. Martialis (Mart., *Ep.* I, 21; *Ep.* III, 60; *Ep.* XIII, 48; *Ep.* XIV, 101), Juvenal (Juv., *Sat.* V, 146; *Sat.* VI, 619) and Apicius (Apic., *De Re Coq.* VII, 13) also mention it, and in Greek literature the mention of this species does not appear before Galen (Gal., *De Alim. Facult.* II, 69). Along with truffles, they were probably the most valued mushrooms. No mention of export is known from ancient sources, although it is possible that when Plutarch uses the title “Italian mushrooms”, he just means *boleti*. Exporting would also prove the common occurrence of Caesar’s mushroom north of the Alps, near the original Roman roads. Growth in these conditions has been linked to the Roman legions that supposedly brought spores north of Italy (Gminder – Böhning 2009, 121), but it is unlikely that so many spores would be caught in the clothing and armament of the Roman troops. More likely, shipments of mushrooms traveled to the area that would spread spores at regular intervals.

Under the name *suillus*, the Romans probably knew different kinds of mushrooms, and as mentioned above, they are associated, from an etymological point of view,

⁹ Note: The species of a small bird, Western Orphean warbler (*Sylvia hortensis*) or Garden warbler (*Sylvia borin*).

mainly with the penny bun (*Boletus edulis*) and the scaber stalk (*Leccinum scabrum*). Pliny does not trust this kind. He considers it “poisonous” and criticizes people for finding pleasure in such a dubious kind of food (Plin., *NH.* XXII, 47). He adds, however, that “*suilli* should be dried, stringed and immediately hanged, as we see with those from Bithynia”. Apparently, they were importing them from Bithynia, although they grew also in Italy and other parts of the Roman Empire.

In addition to *boleti* and *suilli*, Pliny lists three other edible species. He says that “the safest ones are those with red skin but a darker tint than *boleti*” (Plin., *NH.* XXII, 47). Houghton has identified this species as *Russula alutacea* (Houghton 1885, 32). The second is “a white species, with hats remarkable for their resemblance to the conical caps of Flamens” (Plin., *NH.* XXII, 47). The *apex*, the head cover used by the religious order of Flamens, is very similar to the hat of the shaggy ink cap (*Coprinus comatus*; **Fig. 5**) (Houghton 1885, 32). Regarding poplars, Houghton mentions *fungi populi*, therefore the poplar fungi, thanks to which this kind of tree was reportedly so valued (Plin., *Nat. His.* XVI, 35). It was probably a black poplar mushroom (*Agrocybe aegerita*), which grows almost exclusively in symbiosis with the black poplar (Gminder – Böhning 2009, 161).

Other species can be identified in other sources. Apicius often writes about *fungi farnei* (Apic., *De Re Coq.* VII, 15), which are etymologically associated with morel mushrooms (*Morchella esculenta*). A specific case is the field mushroom (*Agaricus campestris*). This kind simply could not be missed in the ancient period. It grows in fields, meadows, pastures and slightly fertilized areas, making the Italian countryside an ideal setting for it. Despite that, we only know about one case when this kind may be mentioned. In *Fasti*, Ovid describes a woman with a family who collects *fungos albos* – white fungi – in a meadow (Ov., *Fast.* IV, 697). The late antiquity mosaic of Toragnola (**Fig. 6**) could also be depicting a variation of the field mushroom, a white mushroom (*Agaricus bisporus*). Finally, we need to mention the saffron milk cap (*Lactarius deliciosus*), which is probably depicted in a fresco in Herculaneum (**Fig. 7**).

After *boleti*, the most popular and expensive were truffles. Pliny collectively refers to all of them as *tuber*, but in some cases adds a closer characteristic. Under the name *tuber* is probably meant white truffle (*Tuber magnatum*). “*Tuber colore rufo*” is probably the red truffle (*Tuber rufum*) and “*tuber colore nigro*” is almost certainly the black truffle (*Tuber melanosporum*) (Plin., *NH.* XIX, 11). As *misy*, he refers to an herbal product “which characteristically has a particularly sweet aroma and taste, but is more fleshy than a *tuber*” (Plin., *NH.* XIX, 12). These are believed to be mushrooms of the genus *Terfezia sp.*, also called desert or false truffles (first mention by Tulasne 1851, 175).

We know several regions from which truffles were imported. Pliny said that the most valued were the ones from Africa (Plin., *NH.* XIX, 11), the best Asia Minor

truffles come from Lampsakos and Alopekonnos and the best Greek ones from Elis (Plin., *NH.* XIX, 13). For false truffles, he mentions the North African province of Cyrenaica (Plin., *NH.* XIX, 12). For Pliny, truffles were no more than a lump of clay, justifying the experience of Lartius Licinius, a praetor of Hispanic Carthage, who allegedly, when eating a truffle bit into a denarius that had grown into it and broke his front teeth (Plin., *NH.* XIX, 11).

Growing and the production of mushrooms

Given the strong popularity of mushrooms, it is certainly necessary to take into consideration attempts to grow them. For a man who could learn to reproduce and breed mushrooms would find a huge source of income in ancient Rome.

The earliest noted mention of mushroom cultivation is found in Dioscorides' *De Materia Medica*: "Some people say that the logs of white and black poplar cut into small pieces, scattered throughout a fertilized area, will produce edible *mykétas* in all seasons" (Diosc., *De Mat. Med.* I, 109). It is certainly the same kind of mushrooms mentioned by Pliny when he says that certain poplar species are valued mainly because of the *fungi populi* that grow on them (Plin., *Nat. His.* XVI, 35). The cultivation of poplar mushrooms therefore certainly did not start later than the 1st century AD.

This procedure may even have older roots. It had already been mentioned by Athenaeus in *Deipnosophistae*, citing Nikandros' *Georgica*: "In order to grow the mushrooms artificially, the log of a fig tree must be buried under the ground with manure and sprinkled with spring water; harmless mushrooms start to grow at the bottom, but nothing of inferior quality can be cut off" (Ath., *Deipn.* II, 59). Although the procedure is the same, it does not necessarily have to be the same kind. It can also be oyster mushrooms (*Pleurotus ostreatus*) or other tree mushrooms growing in clusters. However, a reference to Nikandros proves that they already knew this procedure in the 2nd century BC.

The last work that mentions the technique of mushroom cultivation is *Geoponica*, a compilation of ancient works from the 10th century. It again speaks of the production of the poplar mushroom, but changes the details of the procedure: "In order to grow mushrooms, a black poplar stump must be cut off and dough dissolved in water should be poured onto the cut pieces of the trunk. Black poplar mushrooms will soon emerge" (Geop. XII, 41).

In *Geoponica*, there is also another process of mushroom growing mentioned: "If you want mushrooms to grow from the ground, you have to pick out an area of light soil on a cane-covered hill; there it is necessary to collect twigs and other combustible material and burn it all shortly before it starts raining. If the rain does not come, it is necessary to sprinkle the area with clean water. The mushrooms,

however, will be of much lower quality” (Geop. XII, 41). Whether this technique was used in earlier periods is unknown, since no preserved ancient source mentions it. It is questionable whether this procedure can be historically considered the first attempt at the cultivation of field mushrooms.

When it comes to life

The distrust of ancient authors has not always been unfounded. Even though many times they exaggerated or even made up the bad properties of mushrooms, their respect is understandable according to the preserved documents. What was a delicacy for someone could become someone else’s last meal. The most common way of death caused by mushrooms was reportedly suffocation. Nikandros (Nic., *Alexiph.*, 521–522), Dioscorides (Diosc., *De Mat. Med.* I, 168; II, 137; III, 26; IV, 83–84.), Galen (Gal., *De Alim. Facult.* II, 69) and Athenaeus (Ath., *Deipn.* II, 59) reported that throat contraction occurs after eating bad mushrooms. Even edible mushrooms are said to be harmful, especially in larger quantities, causing flatulence, digestion and gallbladder problems. Cicero complained that although he was not sick of oysters, he was sick of mushrooms (Cic., *Ad Fam.* VII, 26). Dioscorides claimed that mushrooms were difficult to digest and come out whole along with excrement (Diosc., *De Mat. Med.* IV, 83; also III, 118; V, 21). Galen also emphasized the bad influence on the stomach and described other numerous symptoms experienced by people poisoned by mushrooms – such as difficulty breathing, fainting and cold sweat (Gal., *De Alim. Facult.* II, 69).

Ancient authors pay particular attention to antidotes and the prevention of poisoning because of this risk. Honey, vinegar, wine, water, salt and combinations thereof are most often repeated in their works as active ingredients. However, many other antidotes also appear. For example, Nikandros mentioned cabbage (Nic., *Alexiph.*, 525–526), and almost a thousand years later, cabbage juice was also mentioned in *Geoponica* (Geop. XII, 17). Pliny and Dioscorides said it is good to eat pears after eating poisonous mushrooms (Plin., *NH.* XXII, 47; Diosc., *De Mat. Med.* I, 168). Herbal medicines were very popular – in combination with wine, vinegar or honey, common rue (*Ruta graveolens*), traveller’s joy (*Clematis*), feverfew (*Tanacetum parthenium*), garden cress (*Lepidium sativum*), radishes (*Raphanus sativus*), grand wormwood (*Artemisia absinthium*), bastard balm (*Melittis melissophyllum*), oregano (*Origanum vulgare*) and hyssop (*Hyssopus officinalis*) are recommended. Paradoxically, the only substances that could be of real help in the case of mushroom poisoning were, at the same time, the most bizarre ones – wine sediments, saltpeter, natron, lead acetate and chicken droppings. All of them in combination with vinegar or wine can evoke vomiting, causing the mushrooms to leave the stomach (Houghton 1885, 28).

Most of the poisoning in antiquity was probably unintentional and caused by poor knowledge of mushrooms. Many species are difficult to distinguish from each other – for example, in the presence of the field mushroom, there is often the poisonous dung roundhead (*Stropharia semiglobata*). If rain washes off the spots from a fly agaric cap, it may resemble a Caesar’s mushroom. The strongly poisonous death cap (*Amanita phalloides*) can resemble several edible fungi to an inexperienced person. The oldest case of death caused by such circumstances is documented by Euripides, when a mother with two sons and a young daughter died from an unknown species of fungi (Ath., *Deipn.* II, 59).

The young fruiting bodies of the shaggy ink cap (*Coprinus comatus*) are very tasty, but as the mushroom grows older, it gradually turns black and diffuents. The consumption of such specimens may lead to poisoning. The author’s mention of “dark, slimy, rotting fungi harmful to health” could theoretically refer to such fruiting bodies, as Pliny says the shaggy ink cap was a commonly eaten species (Plin., *NH.* XXII, 47). The Romans also may not have known the difference between a shaggy ink cap and a common ink cap (*Coprinus atramentarius*), which in combination with alcohol, causes an allergic reaction. It is accompanied by redness of the face, a strong heart beat and impaired blood circulation (Gminder – Böhning 2009, 145). Since the Romans regularly consumed mushrooms with wine, it is possible that such a situation often occurred.

There are, however, cases of poisoning that were not accidental at all. This is, for example, the case of Emperor Claudius, who on October 13th, 54 AD, died of poisoning after eating a bowl of *boleti*. Many authors, including Pliny, agree that this was not an unintentional poisoning as in other cases, but that it was done with the knowledge of the Emperor’s wife Agrippina, who this way ensured that her son Nero would take over the throne (Plin., *NH.* XXII, 47). The way of poisoning is still the subject of discussion. According to some versions, a poison from *Locusta* was added to the meal, perhaps through Claudius’ taster Halotus or Agrippina herself. Another option is that in addition to *boleti*, other poisonous species of fungi were added – for example, fly agaric (*Amanita muscaria*) (**Fig 8**) or panther cap (*Amanita pantherina*). It is unlikely that the meal was full of poisoned mushrooms because the taster himself would have been the first victim. Finally, there is also the possibility that the death was not caused by any toxins at all, but by health problems – e.g. cerebrovascular disease (Dugan 2008, 35).

The second case of targeted poisoning is also associated with Agrippina. Her victim was not only the prefect of Nero’s guard, Annaeus Serenus, but also the centurions, tribunes and their families present at the banquet. Pliny mentions *sulli* as the tool for their murders and therefore considers it a very dangerous food suitable for poisoning (Plin., *NH.* XXII, 47).

Although poisoning became a truly powerful political tool in Rome, mushrooms probably played a rare role in it. Plants (e.g. of the genus *Aconitum*) and the sea slug of the species *Aplysia depilans* were used much more frequently (Pitschmann 2010, 125–126).

Only by medical prescription

Mushrooms in antiquity not only helped to take lives, but also to save them. Their first use in medicine was documented in the 5th century BC by Hippocratic author, who mainly used them to disinfect wounds by burning them (Hipp., *Epid.* VII, 102). Mushrooms in connection with fire are also mentioned by Pliny, but without any connection to medicine (Plin., *Nat. His.* XVI, 77, 96). In both cases, it is undoubtedly polyporus, in particular, tinder fungus (*Fomes fomentarius*). This mushroom (**Fig. 9**) has been used throughout human history to preserve and transmit fire because it can smolder for several days. The earliest use of the tinder fungus is documented in the Eneolithic period – a piece of this kind of mushroom was stored in Ötzi's birch bark case (Halpern 2002, 17).

Pliny the Elder talks about other species with healing effects. He writes that *boleti* are good for the stomach (Plin., *NH.* XXII, 47), which is also in direct contradiction with other authors such as Galen, who claims that *boleti* can, on the contrary, cause stomachaches and digestive problems (Gal., *De Alim. Facult.* II, 69). Pliny is the only author who speaks of the medical use of this species. Also, no one else attributed *suillus* with healing effects. He writes that “they are good as a medicine for catarrh and hemorrhoids, which they shrink and over time completely remove. They are also used for freckles and blemishes on female faces. They are also made into a healing solution, similar to that from lead acetate that is used for eye problems. Soaked in water, they are currently being used against ulcers, headaches and dog bites” (Plin., *NH.* XXII, 47).

However, the characteristic medical fungi are not tinder fungi, *boletus* or *suillus*. Since Dioscorides, *agaricum* has been considered to be a “panacea” (Diosc., *De Mat. Med.* III, 1). Pliny the Elder also wrote about *agarica*, even devoting two shorter chapters to it. He distinguished two species. The first one grows around the Bosphorus; it is white and is served in combination with vinegar and honey. The male of the species is firmer and bitter. The female is softer and has a sweet taste, which, however, over time becomes bitter (Plin., *NH.* XXV, 57). The second kind comes from Gaul and grows on oak trees. It has a very strong aroma and is particularly effective against poisons, but is generally considered less effective than the Bosphorus *agaricum*. It grows under the tops of trees and allegedly emits light at night, allowing it to be found and harvested (Plin., *NH.* XVI, 13). However, this information is

very dubious and raises several questions. *Agaricum* has been interpreted since the 19th century as quinine conk (*Laricifomes officinalis*) (Houghton 1885, 27). Bioluminescence is unknown in this species, as in any other species of the genus *Laricifomes sp.* Theoretically, light could be caused by saprophytic mushrooms – decomposers, present on rotting wood. Based on the mention of the night collection of mushrooms, however, it is possible that this information was second-hand to Pliny and he had no personal experience with it. It is unknown whether *agaricum* was also imported from Gaul.

Respect for the food of the gods was a determining attitude in ancient Rome. It meant the careful popularity of mushrooms that bordered extravagance for the elite class, stories of poisoning, important use in medicine, but also the popularity of a few species (truffles, Caesar's mushrooms). Despite the theories of mushroom cultivation which have been used to date, the authors of this article only managed to prove the cultivation of one species from the works of ancient authors. In other cases, the inhabitants of the Roman Empire were probably dependent on seasonal harvests.

Different types of mushrooms could have had different names among different authors, and the aim of this paper was to identify, summarize and, if possible, assign them to known species. The use and popularity of mushrooms in Central Europe today is incomparable to what we know from the works of ancient authors. Nevertheless, antiquity's knowledge and culinary art can be interesting inspiration for the present.

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Fig. 1. *Marcus Gavius Apicius* included mushrooms in his recipes. Author: Carole Raddato. Wikimedia Commons (CC BY-SA 2.0).

https://upload.wikimedia.org/wikipedia/commons/a/a5/Apicius_Honeyred_mushrooms%2C_Ingredients_%2815168854543%29.jpg (20.4.2020)



Fig. 2. *Morchella esculenta*. Author: Miroslava Daňová.



Fig. 3. *Amanita Caesarea* – Caesar's Mushroom. Author: Archenzo. Wikimedia Commons (CC BY-SA 3.0). https://commons.wikimedia.org/wiki/File:Amanita_caesarea.JPG (20.4.2020)



Fig. 4. Mosaic with *Amanita Caesarea* (?). Aquileia, Basilica di Santa Maria Assunta, early 4th century AD. Author: Carole Raddato from FRANKFURT. Wikimedia Commons (CC BY-SA 2.0).

[https://commons.wikimedia.org/wiki/File:A_detail_from_part_of_an_early_4th_century_AD_mosaic_depicting_a_basket_of_mushrooms_belonging_to_the_floor_of_the_Theodorian_transversal_hall,_Basilica_di_Santa_Maria_Assunta,_Aquileia,_Italy_\(21409510664\).jpg](https://commons.wikimedia.org/wiki/File:A_detail_from_part_of_an_early_4th_century_AD_mosaic_depicting_a_basket_of_mushrooms_belonging_to_the_floor_of_the_Theodorian_transversal_hall,_Basilica_di_Santa_Maria_Assunta,_Aquileia,_Italy_(21409510664).jpg) (20.4.2020)



Fig. 5. *Coprinus comatus*. Author: Jerzy Opiola. Wikimedia Commons (CC BY-SA 3.0). https://upload.wikimedia.org/wikipedia/commons/b/b0/Coprinus_comatus_G4.JPG (20.4.2020)



Fig. 6. Mosaic with variation of the field mushroom. Toragnola, late antiquity. Author: Mark Cartwright, Wild Boar, Roman Mosaic. Ancient History Encyclopedia (CC BY-SA 4.0). Retrieved from <https://www.ancient.eu/image/2615/> (20.4.2020)



Fig. 7. Fresco with *Lactarius deliciosus*. Herculaneum, 1st century AD. Author: Matthias Kabel. Wikimedia Commons (CC BY-SA); modified by Miroslava Daňová https://commons.wikimedia.org/wiki/File:Chicken_MAN_Napoli_inv_8647_Inv_8735.jpg (20.4.2020)



Fig. 8. *Amanita muscaria*. Author: Miroslava Daňová.



Fig. 9. *Fomes fomentarius*. Author: Miroslava Daňová.