

History of mushroom consumption and its impact on traditional view on mycobiota – an example from Poland

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Kotowski MA 2019 – History of mushroom consumption and its impact on traditional view on mycobiota – an example from Poland. *Microbial Biosystems* 4(3), 1-13.

Abstract

For millennia, fungi have been known by various communities as a valuable source of nutrition and medicines, however traditional view on mycobiota has changed throughout the history. A major role in this context played past scholars and scientists whose impact on attitude towards mushroom collection is also seen in our times. Their confrontation with traditional folk knowledge on mycobiota could be the cause of current division between mycophobic and mycophilic nations. The aim of this article is to present these changes from the perspective of Polish nation, which is currently considered as highly mycophilic. The visible change in scholars' attitude towards fungi and acceptance of folk view on mushrooms took place not earlier than at the turn of XVIIIth and XIXth century. Long scientific reluctance to fungal kingdom has caused that knowledge about wild edible fungi is still limited and we still have broadly explore the world of fungi. With the right approach, mushrooms are able to provide us with many, possibly yet unknown benefits.

Keywords – Egypt, ethnomycology, mycophilia, mycophobia, macromycetes.

Introduction

The history of mushroom consumption is probably as long as the history of food gathering, which was one of the main pillars of primeval society's survival (Boyden 1973). For millennia, fungi have been known by various communities as a valuable source of nutrition and medicines (Buller 1914; Wasson, Wasson 1957; Power et al. 2015).

The 2015 study, conducted by the research group connected with Max Planck Institute for Evolutionary Anthropology in Leipzig, proved the presence of mushrooms in a human diet as early as the Upper Palaeolithic Period. The discovery emerged from the examination of dental calculus from teeth found in the Lower Magdalenian burial of a woman, also known as the "Red Lady", where ochre covered remains were found in 2010 at El Mirón cave in Cantabria (Northern Spain) (Power et al. 2015) (Fig. 1).

Radiocarbon dating of the burial site indicated its age as approximately 18700 years ago. The food remains preserved in dental calculus have proven the presence of mushrooms from *Boletales* order and other closely unidentified agaric mushrooms in the Red Lady's diet. Later, but also significant, was the confirmation of fungal fruiting bodies in practical use by primeval communities, such as the case of Ötzi. Ötzi was a hunter living around 3300 BCE, whose frozen body was found in the mountains near the Ötztal valley in Southern Tyrol (Fig. 2.). Among Ötzi's equipment three fungal objects were found. The first one was the „Black Matter” which later was identified as a material prepared from *Fomes fomentarius* (L.) Fr.. The other two were determined

to be fragments of *F. betulina* ((Bull.) B.K.Cui, M.L. Han & Y.C. Dai) fruiting bodies. The item made from *F. fomentarius* was used by Ötzi as tinder. This fungus is currently known for its use starting fires. In contrary to *F. fomentarius*, *F. betulina* was not used as a tool. It is most probably the first known example of fungal fruiting bodies' used as a source of medicine (Peintner, Pöder 2000; Niksic et al. 2015). The research aiming at determination of the state of Ötzi's health at the moment of his death indicated the presence of whipworm (*Trichuris trichiura* L.) in his body, which is the human parasite classified in the roundworms phylum. Today we have knowledge that the combination of agaric acid and toxic oils present in *F. betulina* can be used as a powerful remedy treating whipworm infection (Capasso 1998).



Fig 1 - Human remains found in the cave of El Mirón (Cantabria, Spain). Press Office of the Government of Cantabria/Wikimedia Commons. 2010. License: Creative Commons Attribution – ShareAlike 3.0 Unported.



Fig 2 - Naturalistic reconstruction of Ötzi using forensic methods, exhibited in the South Tyrol Museum of Archeology. Thilo Parg / Wikimedia Commons. 2014. Bolzano, Italy. License: Creative Commons Attribution - ShareAlike 3.0 Unported.

Mushrooms as entheogens

Currently, many researchers suggest the importance of fungi in the creation of early religious practises (Guzmán 2009). There are many examples suggesting ancient use of fungal fruiting bodies containing psychoactive compounds in order to achieve metaphysical experiences. According to the pioneer of ethnomycological research – Robert Gordon Wasson, fly agaric (*Amanita muscaria* (L.) Lam.) was the first fungal species used as an entheogen (Fig. 3.). It is speculated that it was used by people living in north Eurasian woodlands about 9000 BCE (Wasson, Wasson 1957; Hajicek-Dobberstein 1995). Aside from Siberia, this fungus species was used during Palaeolithic era for religious purposes in North Europe and in Saharan Region, where currently macrofungi are considered as a rarity (Samorini 2001; Grzywnowicz 2002; Grzywnowicz 2007; Wexler 2014; Niksic et al. 2015). The cave paintings found in Tassili mountain range (south-east Algeria), which depict dancing humans holding items resembling in shape fungal fruiting bodies are dated 5000 BCE (Samorini 2001).



Fig 3 - Fly agaric (*Amanita muscaria*). Marcin Kotowski. 2017. Radziejowice, Poland.

The mushroom cult was also present in Mayan culture, who described psychedelic fungi (mostly species belonging to *Psilocybe* genus and above mentioned fly agaric) as *Teonanácatl*, which meant *body and food of gods* (Wasson, Wasson 1957; Wexler 2014; Niksic et al. 2015).

It is also believed that the fly agaric could be one of the ingredients of a Vedic ritual drink *Soma*, which purpose was to induce hallucinations and to make people capable of achieving heroic deeds (Hajicek-Dobberstein 1995). In many cultures, the fly agaric was known as a *single eye* which supposedly was connected to its resemblance to human eye in early development stage

(Wasson 1971). That is why it was also associated, among others, with one-eyed Odin, the highest of the Nordic gods (Hajicek-Dobberstein 1995; Motyka, Marcinkowski 2014) (Fig. 4.). In *Grimnismál*, one of the poems included in the oldest known written relic of Icelandic literature – *Poetic Edda*, Odin is described as *Sithhott* or *Sidhhotr*, which can be translated as *long hood* or *with broad hat* (Bellows 1936, Hajicek-Dobberstein 1995). Undoubtedly, this evokes further mycological connotations.



Fig 4 - The one-eyed Odin. In: *Stofnun Árna Magnússonar á Íslandi*. Árni Magnússon. 1765. Iceland. Licence: Public Domain.

Antique

In Ancient Egypt, mushrooms were regarded as plants of immortality, which were given to people by the god Osiris. Because of their unique taste, mushrooms were proclaimed as a food reserved only for Egyptian royalty. Common people were not only disallowed to eat them, but even forbidden to touch them. (Niksic et al. 2015). Mushrooms were treated with a great affection also by the Romans (Bill 1860; Albinowska 1916) (Fig. 5.). The ancient Romans described them as the food of Gods (Niksic et al. 2015). Also in this case mushrooms gained the status of luxury product, available only for the rulers. Affluent Romans relished truffles (*Tuber* spp. P. Micheli ex F.H. Wigg.) most of all, porcini mushrooms (*Boletus edulis* Bull.), caesar's mushroom (*Amanita caesarea* (Scop.) Pers.), mushrooms (*Agaricus* spp. L.) and puffballs (*Lycoperdon* spp. sensu lato Pers.) (Buller 1914). Among available records related to mushroom use during ancient Roman times, we can also find the first mentions of knowledge about the poisonous properties of mushrooms. Rulers' affection towards mushrooms consumption was used by the poisoners, as mushrooms became the perfect instrument to overthrow emperors. An example is the case of

Caesar Claudius, the ruler of the Roman Empire from AD 41 to 54, who was a known mushroom amateur. The records written by Pliny the Elder reveal that on the day of his death he requested a dish from the boletes and caesar's mushrooms (Grimm-Samuel 1991). Before its serving, his wife Agrippina gave the command to Locusta, a notorious poison maker, to take part in the Claudius assassination. It is said that she displayed the knowledge of poisonous mushrooms, which she used in this case. (Herbert, Wójtowicz 2009; Motyka, Marcinkowski 2014; Wexler 2014).



Fig 5 - Mosaic of pig with mushrooms. Museum of Animals, The Museum of Vatican. 200 CE. Vatican. Licence: Public Domain.

A fondness for mushrooms and a risk connected to their consumption were completely incomprehensible for Pliny the Elder – a Roman natural philosopher. In his work “*Historia Naturalis*” he described fungal ecology claiming that *the generative principle of the mushroom is in the slime and the fermenting juices of the damp earth, or of the roots of most of the glandiferous trees* (Riley 1856). Furthermore, he based his knowledge on overheard stories related to fungi. Among others, he described dubious methods of distinction between edible and poisonous mushrooms. For example, he claimed that the safest mushrooms are those with red flesh followed by the white ones with head resembling a cap worn by the flamines (ancient Roman priests). (Fig. 6.)



Fig 6 - Portrait of a flamen. Marble. Louvre Museum, Department of Greek, Etruscan and Roman Antiquities. Ca 250-260 CE. Paris, France. Licence: Public domain.

According to Pliny, the most poisonous mushrooms are those which have livid colour. Pliny also mentioned a few known cases of deadly poisonings caused by mushrooms. He listed Annaeus Serenus, captain of Nero's guard, tribunes and centurions. At the same time, he wonders *what great pleasure, then, can there be in partaking of a dish of so doubtful a character like this?* Throughout the entire description, we can notice a certain fear of mushrooms which today would be named as mycophobia (Wasson, Wasson 1957; Peintner et al. 2013; Kotowski 2016, 2019). Having in mind many records of mushroom poisonings, it became impossible for him to investigate whether certain fungi species are suitable for consumption or not without putting his health and life at risk. According to Pliny the best solution would be to completely give up on them. While writing down his thoughts, Pliny was certainly unaware how big impact his words will have on future scientific perception of fungi.

Medieval and modern Poland

Pliny's discourse on mushrooms established centuries-old attitude towards mycobiota among „enlightened” part of human society. His influence was present among scholars even in countries currently considered as highly mycophillic such as Poland (Kotowski 2019). While looking through mushroom descriptions present in sixteenth-century works of Polish botanists, we can find many clear analogies to Pliny's beliefs. Copy of his points are present in the herbals of Simon Syrenius (1613), Marcin of Urzędów (1595) and Hieronim Spiczyński (1571). Among the others, we can find there Pliny's statement that mushrooms can cure ulcers or so called *excrescences of the fundament*, bites inflicted by the dogs or that they are used for freckles and spots on women's faces. Another element connecting works of early Polish naturalists with the attitude of Roman philosopher is the tendency to base knowledge about fungi on overheard stories about their poisonous nature. In his work Marcin of Urzędów recounts the story of a man who once ate a dish from mushrooms what nearly costed his life (Fig. 7. A - C)

A lenus 2. Ali. Grzyby są złe z swęcy natury / bo czynią zła krew w człowiecze / a nic innego nie są ie-

Mushrooms are bad by nature/they do bad blood in human

B iżem widział gdy ieden iadł Grzyby / tedy go w piersiach dusiły gryzając / aż vmozżyły.

I saw when one ate mushrooms/they started to choke him and puncture in lungs/till his death.

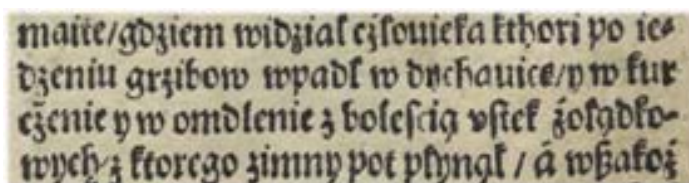
C ięść / ale iednak ięśli ich kto wiele ię / tedy zaszkodzi człowiekowi / trudno ię strawić / a człowiek wielką duszę y dawię / koleryczną niemoc czynią / to ięst biegunkę żółtą. Jam widział iednego gdy ich sobie świeżych napięł / y na smażył y iadł / ale bogu słuł wiec y ich nieiadać / gdy go zostawiły żywo.

/but when someone eat them in excess/then they harm a man/stomach digest them hardly/ and they choke and suffocate the man/ choleric sickness inducing/ that is yellow diarrhoea. I saw one when he baked them fresh/and fried and ate/then he swore before God not to eat them anymore/when they left him alive.

Fig 7 - A, B, C - Excerpts from: Herbarz polski to iest o przyrodzeniu ziół y drzew rozmaitych, y innych rzeczy do lekarzów należących księgi dwie Marcina Urzędowa. Marcin z Urzędowa. 1595. Kraków, Poland. Licence: Public Domain.

Marcin of Urzędów also recalls the famous saying of a Polish medieval doctor – Maciej Miechowita, that *while preparing mushrooms for consumption you should rinse them, blanch them briefly, sauté them in butter and then, after seasoning, throw them out of the window.*

Hieronim Spiczyński in his herbal wrote (Fig.8):



maite/gdzjem widzial cjsouiefa kthori po ies
dzeniu grzybow wypadl w drachauice/y w fur
czenie y w omdlenie z bolescia wstef zofadfo-
wych z ktorego zimny pot plynal / a w fakoż

I saw a man, who after eating mushrooms fell into gasping/and into whirring and into faintness with the stomach ache/and from who cold sweat ran/

Fig 8 - Excerpts from: O ziołach tuteicznych y zamorskich. Spiczyński, H. 1571. Kraków. Licence: Public Domain.

Simon Syrenius claimed that mushrooms cause intestinal colic and just concluded that mushrooms *do not do any good*. Polish early naturalists also referred to other ancient scholars such as Pedanius Dioscorides living c. 40 – 90 AD or Claudius Galenus (129 AD – c. 200/c. 216), who asserted that poisonous mushrooms grow near rusty iron, poisonous beasts' dens, rotten clothes and dung. Preservation of this knowledge was most likely possible due to a long history of scholarly fear of mushroom poisoning. Teodor Zawacki in his seventeenth-century work, „Memoriale oeconomicum” (1616), advised that people should eat as less as possible mushrooms to stay in a good health. As the reason for that, he only mentioned that mushrooms are *ulcera terrae*, which can be translated as *earth's ulcers*. Mushrooms were dealt with distrust even by one of the most respected Polish naturalists Jan Krzysztof Kluk. While describing fungi, he wrote that *they are either dangerous or useless food for humans* (Kluk 1805).

At that time folks, who treated science with caution and did not have access to knowledge present in scholarly books, have very different attitude towards mushroom collection. Even in the works of some earlier mentioned Polish naturalists there are reports on well-known affection for mushrooms not only among common folks, but even well-founded people, who eagerly bought large amount of mushrooms at local markets. Among species commonly used by local communities Syrenius listed: *grzyby* (*Boletus edulis* s.l.), *kozakowie* (*Leccinum* spp.), *biele* (*Lactarius piperatus* (L.) Pers.), *rydze* (*Lactarius deliciosus* s.l. (L.) Pers.), *posadki* or *podsadki* (*Clitopilus prunulus* (Scop.) P. Kumm.), *smarze* (*Morchella* spp. Dill. ex Pers.), *piestrznice* (*Gyromitra esculenta* (Pers.) Fr.), *olszówki* (*Paxillus involutus* s.l. (Batsch) Fr.) and *holubki* (*Russula* spp. Pers.) (names identification according to: Bartnicka-Dąbkowska 1964; Kotowski 2019).

Currently either *Lactarius piperatus*, *Gyromitra esculenta* and *Paxillus involutus* are considered as inedible or poisonous in Poland. For centuries, fungi have been important component of villagers' diet. They were treated as a common good. According to folks the only factor able to assign someone's property was work. Everything that was created by itself, was a gift from God, so everyone could equally benefit from it (Biegeleisen 1929). Eliza Orzeszkowa in her work describing relations between common people and nature „People and flowers at the Niemen river” cite saying *Kali chlebno, to nie hrybno, a kali hrybno, to nie chlebno*, which means that *when there is a plenty of bread there are no mushrooms and when there are many mushrooms there is no bread* (Orzeszkowa 1888). It shows the significance of mushrooms during times of scarcity. On the other hand, fungi were also often treated as a delicacy served during holidays. To this day, mushrooms are considered as an important ingredient of dishes served during Christmas supper in Poland. They were used in *pośnik*, which is a set of dishes served during fast-day supper (Staniszewska 1902). For centuries fungi were also considered as an important source of income

for rural households. They were sold fresh, dried, salted, fermented or in later years, pickled for wealthier people or city residents. (Bill 1860; Albinowska 1916, Kotowski 2016). Folks usually kept for themselves the less valuable species or *mushrooms with holes* while selling to the merchants species, such as boletes, truffles, saffron milk caps or mushrooms (*Agaricus* spp. L.). Sautéed boletes, saffron milk-caps, yellow knights (*Tricholoma equestre* (L.) P. Kumm.), charbonniers (*Tricholoma portentosum* (Fr.) Quél.), gypsy mushrooms (*Cortinarius caperatus* (Pers.) Fr.) or slippery jacks (*Suillus luteus* s.l. (L.) Roussel) were considered as a delicacy on a par with meat (Chętnik 1936) (Fig. 9).



Fig 9 - Mazovian resident collecting mushrooms. Marcin Kotowski. 2016. Radziejowice, Poland.

The difference between fungal species consumed by wealthy and folk people in Poland is described in the nineteenth-century work of Łukasz Gołębiowski “Households and manors” (1830). He wrote that wealthy people only knew *rydze* (*Lactarius deliciosus* s. l.), *smardze* (*Morchella* spp.), *pieczarki* (*Agaricus* spp.) and *trufle* (*Tuber* spp.). Common people, on the other hand, collected *syrojeszki* (*Russula integra* s.l. (L.) Fr.), *chrząszcze* or *chrząstki* (*Lactarius vellereus* (Fr.) Fr.), *świniarki* (*Russula nigricans* Fr.), *pieprzniki* (*Cantharellus cibarius* s.l.), *gołąbki* (*Russula aeruginea* s.l. Lindbl. ex Fr.), *gąski* (*Tricholoma portentosum*), *jelonki* (*Lactarius torminosus* (Schaeff.) Gray), *kutmanki* (*Lactarius piperatus*), *opieńki* (*Armillaria* spp. (Fr.) Staude), *zielonki* (*Tricholoma equestre*), *mleczaje* (*Lactarius* spp. Pers.), *babki* (*Leccinum scabrum* (Bull.) Gray), *pożarki* (unidentified *Boletales*) and *maśluki* (*Suillus luteus* s.l.) (id.: Bill 1860; Majewski 1894; Bartnicka-Dąbkowska 1964; Kotowski 2019).

The appreciation of their food values at the courts was described by Adam Mickiewicz in mushroom picking scene presented in the national epic poem of Poland “Pan Tadeusz”, which is considered to be the last great epic poem in European literature (Fig. 10.)

Of mushrooms⁸¹ there were plenty: the lads gathered the fair-cheeked *fox-mushrooms*, so famous in the Lithuanian songs as the emblem of maidenhood, for the worms do not eat them, and, marvellous to say, no insect alights on them; the young ladies hunted for the slender *pine-lover*, which the song calls the colonel of the mushrooms.⁸² All were eager for the *orange-agaric*; this, though of more modest stature and less famous in song, is still the most delicious, whether fresh or salted, whether in autumn or in winter. But the Seneschal gathered the toadstool *fly-bane*.

The remainder of the mushroom family are despised because they are injurious or of poor flavour, but they are not useless; they give food to beasts and shelter to insects, and are an ornament to the groves. On the green cloth of the meadows they rise up like lines of table dishes: here are the *leaf-mushrooms* with their rounded borders, silver, yellow, and red, like little glasses filled with various sorts of wine; the *kozlak*, like the bulging bottom of an upturned cup; the *funnels*, like slender champagne glasses; the round, white, broad, flat *whities*, like china coffee-cups filled with milk; and the round *puff-ball*, filled with a blackish dust, like a pepper-shaker. The names of the others are known only in the language of hares or wolves; by men they have not been christened, but they are innumerable. No one deigns to touch the wolf or hare varieties; but whenever a person bends down to them, he straightway perceives his mistake, grows angry and breaks the mushroom or kicks it with his foot: in thus defiling the grass he acts with great indiscretion.

Fig 10 - Excerpts from: Pan Tadeusz; Or The Last Foray in Lithuania: A Story of Life Among Polish Gentlefolk in the Years 1811 and 1812. Mickiewicz, A., George Rapall, N. 1920. JM Dent & Sons, Limited. Toronto, Canada. Licence: Public Domain.

In the above example we can notice that the scholarly despise for mushrooms was general knowledge among prosperous Poles. However, due to their own observations and strong traditions, which could not be undermined by current scholar’s view on fungi, they preserved their own favourable opinion on the world of fungi. Described in this excerpt species are: *Cantharellus cibarius* (*fox-mushrooms*, orig. *lisice*), *Boletus edulis* (*pine-lover*, orig. *borowik*), *Lactarius deliciosus* (*orange-agaric*, orig. *rydz*), *Amanita* spp. (*fly-bane*, orig. *muchomor*), *Russula* spp. (*leaf-mushrooms*, orig. *surojadki*), *Leccinum* spp. (*kozlak*, orig. *koźlak*), *Craterellus cornucopioides* (L.) Pers. (*funnels*, orig. *lejki*), *Lactarius piperatus* s.l. (*whities*, orig. *bielaki*), *Lycoperdon* spp. (*puff-ball*, orig. *purchawka*) (Mickiewicz 1898; id.: Bartnicka-Dąbkowska 1964; Kotowski 2019).

The visible change in scholars’ attitude towards fungi and acceptance of folk view on mushrooms took place not earlier than at the turn of XVIIIth and XIXth century. Johan Georg Bill in his work “The most important edible and poisonous mushroom species” (1860) writes about rebirth of natural science and scientists’ sacrifice in recognizing mushrooms as a valuable food:

Finally, however, constant experiments undertaken by the experts who, in order to ensure our fertile prosperity, for some conclusions sacrificed their own health or even life, caused that nowadays we can eat many mushrooms without any fear.

He mentioned also *overzealous people*, who in the past treated all mushrooms as poisonous or suspicious, basing their beliefs on overheard stories, not on scientific knowledge. Moreover, he pointed out that because of this fact, many species were wrongly described as poisonous. This baseless bias caused that and in some cases discouraged people and resulted in the loss of an important source of food. Polish naturalist Stanisław Bonifacy Jundziłł also noted errors related to past view on fungi. In his work “Applied botany...” (1799), he wrote that *among former botanists, for a long time fungi have been perceived as deformed and random spawns of decay*. On 15th May 1849 on the pages of Warsaw Courier took place a specific kind of confrontation between editor in chief, Kazimierz Kucz and old-fashioned poet, Stanisław Trembecki. Trembecki stated that the majority of fungi species are poisonous and, in case of a few exceptions, there is big risk that they were contaminated by a dust of dried poisonous mushrooms which travels with the wind. He also supported his arguments with a manipulation known since the Plinian times, which is listing all known cases of mushroom deadly poisonings. He summarized his description with the comment:

I absolve a pauper, who while looking for food, hazard his life by eating just any dishes, but for the people who are not in need, it cannot be forgiven.

Above statement was retorted by Kazimierz Kucz, saying: *Dear Sir Trembecki, thou by rootling in some old scraps of paper, want to deprive us from the delight of swallowing mushrooms, which so many eat without causing any harm to their health.*

Summary

The examples from Poland presented here suggest that one of the main reasons behind the current division on mycophilic and mycophobic societies might be connected to historic scholar influence on common people and local traditions related to mushroom consumption. Polish medieval naturalists were highly influenced not only by antique scholars such as Pliny the Elder, Pedanius Dioscorides or Aelius Galenus, but also by the works of western scholars such as Pierandrea Matthioli, Leonhart Fuchs or Conrad Gessner (Elbanowski 2014). While analysing sources of knowledge presented in Polish medieval herbals, we can notice that in majority it was brought to Poland from areas currently known as mycophobic (Peintner et al. 2013; Elbanowski 2014; Kotowski 2016). Therefore, it is possible that current opinions towards mushrooms is still shaped by these ancient superstitions.

Currently, we have a much broader knowledge about mushroom nutritional values. They contain higher levels of potassium and phosphorus than the majority of vegetables, relatively high amount of ergosterol (provitamin D₂) and protein which have intermediate characteristics between animal and plant proteins. Some species also contain high levels of antioxidants (Kalač 2009). Moreover, polysaccharides present in fungal fruiting bodies can act as antigens, which are able to activate immune system and help to prevent cancerous tumours (Kidd 2000; Wasser 2002). It appears, therefore, that fungi are not so nutritionally useless as it was previously declared. Nevertheless, knowledge about edible fungi is still limited. As stated in the Polish macrofungi guide created by Barbara Gumińska and Władysław Wojewoda, in Poland there are around 170 wild growing edible fungi. According to the recent estimations this number should range from 1100 to 1400 species and most of them have unspecified nutritional values (Grzywacz 2008).

Despite being built on mistrust, a rough and one-sided relationship between humans and fungi has prevailed for centuries. In the human perception, fungi have a long history of committing treason against their admirers, and this has been inciting mistrust for centuries. Today, however, we are beginning to notice that these harmful effects stemmed from our unawareness and lack of knowledge. Regardless of a long history of coexistence, we are still learning to explore the world of fungi. With the right approach, mushrooms are able to provide us with many, possibly yet unknown benefits.

Acknowledgements

The author would like to thank Prof. Robert A. Blanchette (Department of Plant Pathology, University of Minnesota, St. Paul, Minnesota, United States of America) for the critical reading of the manuscript and the two reviewers for their valuable comments. I would like to express my deep appreciation to Prof. Ahmed M. Abdel-Azeem (Botany Department, Faculty of Science, Suez Canal University) for suggesting the point of this review and his continuous support during preparation of the manuscript. Last but not least I would like to thank my supervisor Prof. Łukasz Łuczaj (Department of Biology and Biotechnology, Collegium of Natural Sciences, University of Rzeszów, Poland) for revising the Polish version of this review.

The work was financed by the National Science Centre (NCN) within the activities of the research project Preludium (2015/17/N/NZ9/00963).

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