Etnobiología, 2026, 24(2), ISSN: 2448-8151 **Artículos**

PERCEPTION AND VALUATION OF MACROFUNGI BY CONTEMPORARY SOCIETY

PERCEPCIÓN Y VALORACIÓN DE LOS MACROHONGOS POR LA SOCIEDAD CONTEMPORÁNEA

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DOI: 10.51438/etnobiolv24n2a3

Recibido: 31 marzo 2025
Aceptado: 07 julio 2026

Resumen:

Fundamentales en el ambiente, los macrohongos a menudo pasan desapercibidos, un fenómeno conocido como "ceguera micológica", es decir, una percepción distorsionada que los asocia principalmente con organismos nocivos y enfermedades. Así, este estudio tuvo como objetivo evaluar las percepciones y valoraciones de la sociedad en relación con los macrohongos mediante cuestionarios estructurados, utilizando un enfoque cuali-cuantitativo. Los datos se recopilaron a través de un cuestionario de 20 preguntas, administrado mediante Google Forms y distribuido en plataformas de redes sociales (WhatsApp e Instagram). Se obtuvo un total de 300 respuestas provenientes de 55 ciudades de las cinco regiones de Brasil. Entre los participantes, el 69,7% reportó estar familiarizado con el concepto de macrohongos y el 80% tenía conocimiento previo sobre las setas. Los patios fueron los lugares más comúnmente reportados para la observación de estos organismos (91,3%), y el 38,7% de los encuestados indicó que los observaba "a veces". La mayoría de los participantes (76,7%) asoció los macrohongos con la descomposición, y el 88% reconoció sus beneficios para la sociedad. El principal uso reportado fue como alimento (63%); sin embargo, más del 50% indicó un contacto limitado con estos organismos, y la mayoría señaló que no los destruía al encontrarlos. Estos hallazgos destacan que, a pesar de percepciones positivas como la curiosidad y la admiración, los macrohongos aún enfrentan estigmas relacionados con la toxicidad y son subvalorados. Aunque sus contribuciones ecológicas, nutricionales y medicinales son ampliamente reconocidas, los macrohongos siguen ocupando un lugar secundario en los esfuerzos de conservación y concienciación ambiental. Estos resultados resaltan la importancia de programas de educación ambiental para promover una mayor interacción con los macrohongos.

Palabras clave: Cogumelo, Conocimiento micológico, Micofilia-micofobia.

Abstract:

Macrofungi are present in daily life in various forms; however, despite their fundamental role in the environment, they often go unnoticed, a phenomenon known as "mycological blindness", that is, a distorted perception that associates them primarily with harmful organisms and disease. Thus, this study aimed to evaluate society's perceptions and valuations of macrofungi through structured questionnaires using a qualitative-quantitative approach. Data were collected through a 20-question survey administered via Google Forms and distributed on social media platforms (WhatsApp and Instagram). A total of 300 responses were obtained from 55 cities across the five regions of Brazil. Among the participants, 69.7% reported being familiar with the concept of macrofungi, and 80% had prior knowledge of mushrooms. Backyards were the most commonly reported location for observing these organisms (91.3%), with 38.7% of respondents indicating that they observed them "sometimes." Most respondents (76.7%) associated macrofungi with decomposition, and 88% recognized their benefits to society. The primary reported use was as food (63%); however, more than 50% indicated limited contact with these organisms, and the majority reported that they did not destroy them when encountered. These findings highlight that, despite positive perceptions such as curiosity and admiration, macrofungi still face stigma related to toxicity and are undervalued. Although their ecological, nutritional, and medicinal contributions are widely recognized, macrofungi remain secondary in conservation and environmental awareness efforts. These results underscore the importance of environmental education programs to promote greater interaction with macrofungi.

Keywords: Mushroom, Mycological knowledge, Mycophilia-mycophobia.

INTRODUCTION

There are approximately 155,000 species of fungi in the world (State of the World's Plants and Fungi, 2023), many of which develop visible fruiting bodies represented by wood ears, starfish, puffballs, bird nests, and mushrooms. Although these striking structures are present in society's daily life, macrofungi still suffer from so-called "mycological blindness" (Ferreira and Lima, 2022); that is, there is a distorted view of these organisms, which are often associated with malefic and disease-causing beings (Silva and Gouw, 2021). This indifference and aversion toward fungi is known as mycophobia, whereas the interest in and use of these organisms characterize mycophilia (Fidalgo, 1968; Wasson, 1980), and both may be related to sociocultural variables (Ruan-Soto *et al*., 2013). However, fungi provide ecosystem services of great importance to society, participating in nutrient cycling and the rotation of carbon, nitrogen, and phosphorus in the soil (Rachid *et al*., 2015; Zedda and Rambold, 2015; Singh *et al*., 2025), in addition to contributing to plant growth (Larsen *et al*., 2015) and having sociocultural importance.

Since ancient civilizations, over millennia, macrofungi have been used as sources of food and medicine (Anonymous, 1955). Ethnomycological traditions are documented across 193 cultures worldwide (Kaaronen, 2025). Mushrooms, in particular, have gained significant importance because of their nutritional and medicinal value (Dong *et al*., 2022). They fascinate humans not only for their enigmatic growth patterns but also for their therapeutic properties (Kumar *et al*., 2021). There are estimated to be approximately 130 therapeutic actions attributed to medicinal fungi and more than 2,000 edible species, of which approximately 200 are cultivated commercially or experimentally (Chang, 1996; Perez-Montes *et al*., 2021). In Brazil, more than 400 species of wild edible mushrooms are currently recorded (Drewinski *et al*., 2024). In addition, the mycelium hyphae (myco-composites) have gained prominence in areas such as engineering and civil construction, where lignocellulosic material adhere together by the insertion of a networking material (Palanisamy *et al*., 2023).

Despite the ecological, economic, and cultural importance of macrofungi, few analyses of their perception by different social groups exist. Studies such as that of Rojas *et al*. (2019) discussed perceptions of the use and value of fungi in Central America; Dejene *et al*. (2025) investigated ethnomycological knowledge among local communities inhabiting the Yayo Coffee Forest Biosphere Reserve in southwestern Ethiopia; Molina-Murillo *et al*. (2015) verified the perception of macrofungi in Honduras, Costa Rica; Ruan-Soto *et al*. (2007) investigated the perception of fungi by communities in the Lacandon Jungle, Mexico; Rios-Garcia *et al*. (2023) highlighted the traditional knowledge and use of wild mushrooms in Mazatec culture in Oaxaca, Mexico; Cruz-Lorenso *et al*. (2025) investigated the ethnonomicology of southeastern Mexico, state of Quintana Roo; Fatur (2021) addressed the use of hallucinogenic fungi in Slovenia; Zent *et al*. (2004) addressed the use of fungi by a mycophilic society in the Venezuelan Amazon; Hellwig *et al*. (2024) dealt with the perception of the use of fungi as food; in Brazil: Cavalcante *et al*. (2022) conducted an ethnomycological study in the southeastern Amazon; Dos Reis *et al*. (2024) investigated the perception of fungi by indigenous children and adolescents from the Karajá people of the Bananal Island; Sousa *et al*. (2017) analyzed the perception of a rural community in the Caatinga; Calaça *et al*. (2021) observed the perception of Cerrado farmers; and Oliveira *et al*. (2016) analyzed the perception of students from a public school in northeastern Brazil. However, there is a gap in research focused on society's perception of macrofungi more broadly. According to Carrión (2023), there is an urgent need to increase awareness about the teaching of fungi in education.

Thus, more research in this area is essential to expand the understanding of how people relate to macrofungi, especially in the Brazilian context. This is because individual representations and interpretations of natural elements directly influence attitudes and practices toward the environment (Silva *et al*., 2016). Deepening knowledge about these interactions can contribute to the development of conservation and environmental awareness strategies (Miranda and Souza, 2011). In addition, Melazo (2005) highlighted that

understanding the importance of natural elements and their problems is essential for efficient environmental education. In this context, we aimed to understand the perceptions, valuations and behaviors of society in relation to macrofungi in everyday life, on the basis of the hypothesis that most people are averse to these organisms because they associate them with the decomposition of organic matter and intoxication.

MATERIALS AND METHODS

Development of the questionnaire: The data collection instrument used in the investigation was a research questionnaire (Table 1) developed and validated via Google Forms from management platform. Before accessing the questionnaire, the participants were asked to inform the city and state in which they lived without providing their personal data.

N	QUESTION	ANSWER/RESPONSE
1	Do you know what a macrofungi is?	Yes or No
2	At some point in your life did you learn about mushrooms?	Yes or No
3	Have you ever seen macrofungi (fungi with apparent mushrooms)?	Yes or No
4	If yes. Where did you see this fungus? (you can select more than one option)	Backyard; Bed; Fair/Market; Park; Wall/Sidewalk; I have never seen
5	How often do you observe macrofungi in your daily life?	Always; Frequently; Sometimes; Rarely; Never
6	From your perspective, what is the notoriety of a macrofungi? (you can select more than one option)	Decomposition of organic matter; Causing diseases; Pests; Toxics/Poison; Spirituality; Food
7	Do you think macrofungi bring benefits to society?	Yes or No
8	What benefits of macrofungi do you think are important? (you can select more than one option)	Decomposition; Feeding; Medicine; Poison/Pesticides; Religious/Spiritual; None
9	Have you ever used mushrooms?	Yes or No
10	If yes. How did you use macrofungi? (you can select more than one option)	Feeding; Medicinal; Gardening/Ornamentation; Recreational; Religious rituals/spirituality; I never used it
11	Have you ever had direct contact with any type of mushroom in nature (touching or harvesting)?	A lot; Little; No; I do not remember
12	Would you have any qualms about touching mushrooms that are found in nature?	Yes, I am very afraid; A little, but I would touch carefully; No, I would touch without problems; Never thought about it
13	Do you like mushrooms?	Yes; A little; No; Hate
14	Have you ever destroyed, out of fear, a mushroom?	Yes; No; Many; Sometimes
15	Do you think every wild mushroom is toxic or hallucinogenic?	Yes or No
16	Choose words that best express your reaction to seeing a macrofungi like this in the image below. (you can select more than one option)	Happiness; Disgust; Fear; Beauty; Inquisitiveness; Other
17	Do you believe that the presence of macrofungi contributes to improving the quality of life of the population?	Yes or No
18	In what ways do you believe that macrofungi contribute to people's quality of life? (you can select more than one option)	Provision of ecosystem services (decomposition, mycorrhizae, nutrient cycling, soil protection); Preservation of biodiversity (protecting native species); Protection of natural resources (what can be taken from fungi for medicine and food); Spiritual connection (connection to something spiritual or religious, meaning or purpose); Ornamentation (enrichment of scenic beauty); They do not contribute; Other
19	Do you consider that mushrooms are valued?	Yes, they are highly valued; They are valued, in a limited way; No, they are undervalued; I do not know
20	Do you think there should be an economic incentive for the protection of macrofungal biodiversity?	Yes, the more mushrooms the better; No, I do not like mushrooms; I cannot say, indifferent

TABLE 1

Structure of the questionnaire used to collect quali-quantitative data on the perceptions and interactions of people with macrofungi, applied from 10/14/2024 to 12/04/2024 in digital media in Brazil. (N=question number).

Source: Prepared by the authors.

Anonymous data collection was carried out online, adopting a qualitative-quantitative approach and based on a cognitivist perspective, as proposed by Goes-Neto and Bandeira (2003). A structured questionnaire containing 20 closed questions was used to investigate people's perceptions of macrofungi in everyday life. In the questionnaire, the term "mushroom" was used as a synonym for macrofungi, as it is a more common nomenclature and is widely understood by the population in reference to the macroscopic reproductive structures of fungi.

The questionnaire was disseminated in different WhatsApp groups and on Instagram platform, with the aim of reaching as many participants as possible. The application took place between October 14 and December 4, 2024, covering several cities in different regions of Brazil.

Of the 20 questions, seven were formulated in a "yes" or "no" format, seven were multiple-choice questions, and six were checkbox questions. One of the questions (Q16) included an image of a macrofungi. In addition, an initial, non-enumerated question collected information on the participants' city and state of residence. The questions addressed topics such as recognition of macrofungi, frequency of contact and observation, emotions associated with contact, appreciation of these organisms, recognition of their benefits and uses, attitudes toward the presence of fruiting bodies, affectivity, fears, forms of use, and perceptions of notoriety. Furthermore, participants' understanding of the term and object of the research, the places of occurrence, the presence of and contact with macrofungi, and whether risks were attributed to these organisms were analyzed.

Data analysis

The collected data were organized in electronic spreadsheet and analyzed through descriptive statistics, creating structured categories: *Recognition and observation of macrofungi* (questions 1-5); *Perception and representation of macrofungi* (questions 6-8); *Interactions between people and macrofungi* (questions 9-12, 14, 15); *Emotions and evaluation of macrofungi* (questions 13, 16, 19); *Contributions of macrofungi to quality of life* (questions 17, 18); and *Incentive to the conservation of macrofungi* (question 20). That allowed the analysis of the information throughout the investigation. The analysis was performed on the basis of the percentage and distribution of the answers for each question in the questionnaire. For questions that allowed multiple answers — such as those with checkboxes — the percentages were calculated on the basis of the total number of marks made by the participants; that is, each selected alternative was counted individually, which could result in sums greater than 100%. In checkbox questions that allowed the inclusion of open-ended responses (e.g., an "other" option), the responses were reviewed, categorized according to their thematic similarity, and grouped to facilitate data interpretation and provide a clearer, more objective, and meaningful analysis of the results.

RESULTS AND DISCUSSION

A total of 300 responses to the questionnaire were obtained from different cities in Brazil (Table 2; Figure 1). The responses covered the five regions of the country, with greater representation of the Northeast Region and Central-West Region, which included five and four states, respectively, followed by the Southeast Region and South Region (three states each) and the North Region (only one state). In all, 16 states participated, with Mato Grosso being the most representative, with responses from 15 cities, followed by São Paulo, with 10 cities. However, six states were represented by only one city. The highest concentration of responses occurred in the municipality of Rondonópolis in Mato Grosso (186 responses). Among the 56 cities included in the study, 41 recorded only one response (73.2%).

REGION/STATE	CITY	RESPONSES
CENTRAL-WEST		**251**
Distrito Federal	Brasília	3
Goiás	Goiânia, Iporá, Jesúpolis, Mineiros, Rio Verde	13
Mato Grosso	Campo novo do Parecis, Campo Verde, Canarana, Cuiabá, Itiquira, Jaciara, Nova Xavantina, Pedra Preta, Poxoréu, Primavera do Leste, Rondonópolis, Sinop, Torixoréu, Várzea Grande, Vila Bela da Santissima Trindade	220
Mato Grosso do Sul	Aquidauana, Campo Grande	15
NORTHEAST		**7**
Ceará	Fortaleza	1
Paraíba	Esperança, João Pessoa	2
Pernambuco	Ipojuca	1
Piauí	Parnaíba	2
Rio Grande do Norte	Nísia Floresta	1
NORTH		**4**
Amazonas	Borba, Manaus	4
SOUTHEAST		23
Minas Gerais	Lavras, Monte Claros	3
Rio de Janeiro	Belford Roxo, Paraty, Pinheiral, Rio de Janeiro	4
São Paulo	Araraquara, Guararapes, Guarulhos, Itu, Ribeirão Preto, São Bernardo do Campo, São José do Rio Pardo, São Paulo, Taquaritinga, Tatuí	16
SOUTH		**15**
Paraná	Carambeí, Castro, Curitiba, Esperança, Ponta Grossa	12
Rio Grande do Sul	Pelotas, Porto Alegre, São Marcos	3
Santa Catarina	Rio do Sul	1
Total overall		**300**

TABLE 2

Number of responses to the questionnaire on people's perceptions of macrofungi carried out from 10/14/2024 to 12/04/2024 in Brazil.

Source: Prepared by the authors.

The distribution of responses reflected a greater concentration in some locations, influenced by the dissemination strategy adopted, which occurred mainly through social networks, such as Instagram and WhatsApp groups. These networks were mostly composed of individuals from the same locality and were part of the contact networks of the researcher and his collaborators. This method of dissemination tends to generate a proximity effect, resulting in a concentration of responses in specific areas due to the limited reach of the groups used, which may have restricted the participation of individuals from other regions of the country. Even so, the survey obtained responses from several Brazilian regions, which enabled a comprehensive analysis of the population's perceptions of macrofungi.

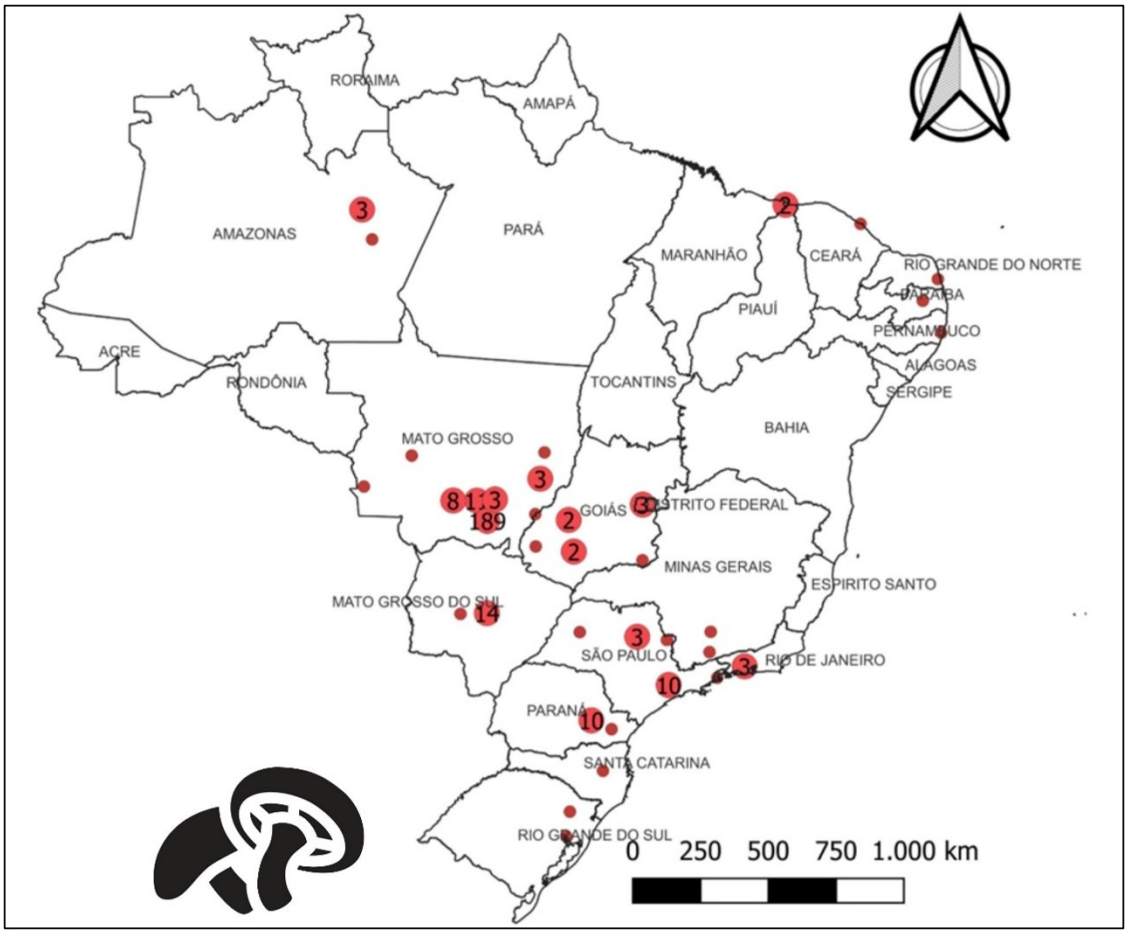


FIGURE 1
Distribution by city of the number of responses to the questionnaire on people's perceptions of macrofungi, carried out from 10/14/2024 to 12/04/2024 in Brazil. Source: Prepared by the authors using the QGIS software and fungi image: Canva.

Recognition and observation of macrofungi (questions 1-5)

The survey revealed that, of the 300 participants, 69.7% said they were aware of what a macrofungi would be, whereas 30.3% were unaware of the term. Despite this, 80% reported having already had some kind of previous learning about mushrooms. These data indicate that although many have received school instruction on the subject, the association between the term "macrofungi" and its representatives in the environment is still limited. This limitation may be related to the way fungi are addressed in formal education. According to Rosa and Mohr (2010), the theme has rarely been explored, which results in a superficial and often fragmented approach. Studies that analyze teaching materials, such as those by Moura (2023) and Gomes (2022), although they do not specifically mention the absence of the term "macrofungi", point to significant deficiencies in the way fungi-related content is presented. Such gaps may contribute to students' lack of familiarity with more specific terms, such as "macrofungi", which are usually introduced only in higher education. In addition, the fact that the term has no taxonomic value may explain its low presence in basic education, despite its recurrent use in the scientific literature, especially owing to its ecological and descriptive relevance.

Regarding the observation of macrofungi, 91.3% of the participants stated that they had seen them at some point. Backyards were the most frequently mentioned place (72%; 216 responses), followed by flowerbeds

(53.3%; 160), walls or sidewalks (53%; 159), parks (51.7%; 155) and fairs or markets (37.7%; 113). On the other hand, 8.7% (26 responses) of the participants stated that they had never observed macrofungi. Regarding the frequency of observation, few participants reported observing macrofungi "always" (7.3%; 22 responses) or "frequently" (11.3%; 34). The majority stated that they perceived them "sometimes" (38.7%; 116) or "rarely" (32.7%; 98), whereas 10% (30) stated that they had never observed them.

The presence of macrofungi in environments such as backyards, flowerbeds, and parks can be explained by their preference for humid areas rich in organic matter. However, the data suggest that these organisms, although present, are not widely recognized. This low perception may be related to the limited way in which macrofungi are perceived in environments, as noted by Ishikawa *et al*. (2012), in addition to the so-called "mycological blindness" discussed by Ferreira and Lima (2022). This phenomenon, analogous to "botanical blindness", refers to the difficulty people have in noticing, valuing and understanding the importance of fungi in their surroundings. According to Silva and Gouw (2021), this behavior is related to cultural and educational factors, which are often neglected in formal education, where the topic is rarely presented in depth in school curricula.

Perception and representation of macrofungi (questions 6-8)

Macrofungi are widely represent the decomposition of organic matter (76.7%) and its use as food (68.3%). However, a significant percentage also associated them with toxicity or poison (40.3%), whereas others related them to spirituality (15.7%) and pathogenicity (12.7%) and, to a lesser extent, perceived them as pests (9%) (Figure 2, blue data). With respect to the perception of the benefits of macrofungi, 88% of the participants recognized that they benefited society. Among the main benefits highlighted are decomposition (73%), food (72.7%) and medicinal application (65.7%). A smaller portion recognized its benefits as pesticides (26.7%) and entheogens/spirituality (19%). Only 6.7% of the participants did not attribute any benefit to macrofungi (Figure 2, orange data).

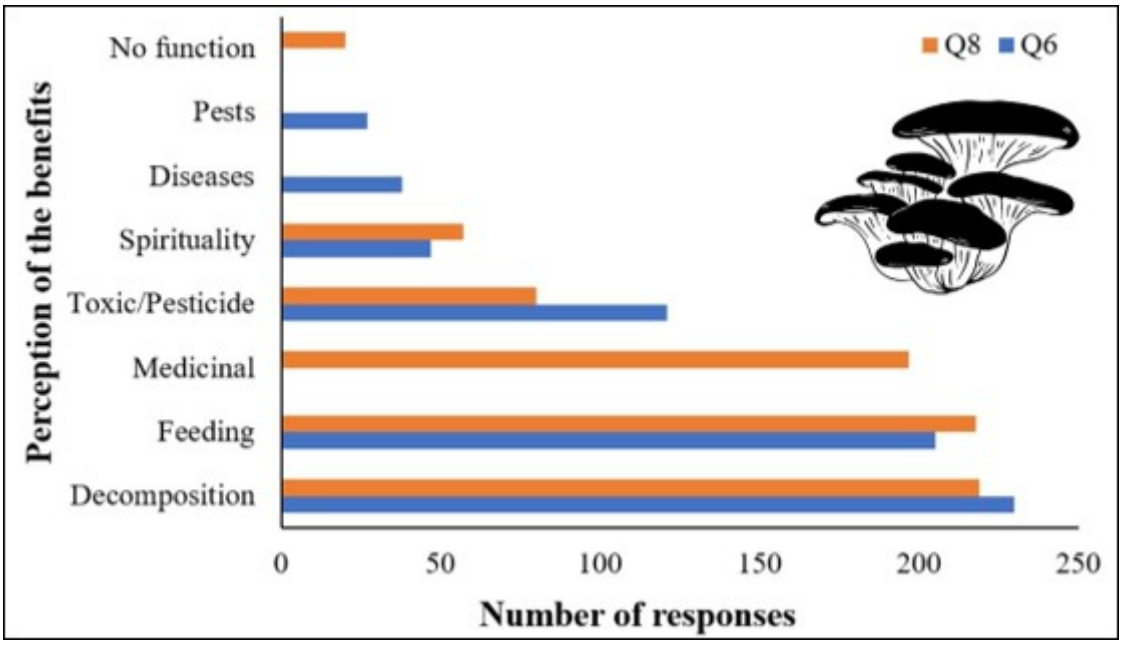


FIGURE 2

Question 6 (From your perspective, what is the notability of a macrofungi?) and 8 (What benefits of macrofungi do you think are important?) of the questionnaire on people's perceptions of macrofungi was carried out from 10/14/2024 to 12/04/2024 in Brazil. Source: Prepared by the authors (image: Canva).

Notably, macrofungi have a certain degree of notoriety in the field of spirituality and were mentioned by 15.7% of the study participants. The "magical", religious, and recreational use of these organisms has been recorded in several ancient civilizations to nowadays, such as that described by Guzmán (2008, 2011), Spiers *et al*. (2024) and Haro-Luna *et al*. (2025). In the community of Chancah, Veracruz, there are certain beliefs regarding specific macroscopic fungi, related to witchcraft (Cruz-Lorenso *et al*., 2025). According to Seethapathy *et al*. (2024), many of these cultures attributed divine or supernatural meanings to mushrooms. In Greek mythology, it was believed that these organisms granted strength to warriors in combat (Ruck, 1981; Ruck and Anton, 2016); in Egypt, they were seen as sacred gifts from the god Osiris (Krikorian, 1978); for the Romans, they had ritualistic value and were treated as sacred food (Buller, 1914; Ruck and Anton, 2016); and magical/sacred uses of mushrooms in Mexico and Guatemala (Guzmán, 2001, 2024). This highlights that, despite fears related to toxicity and possible pathogenicity, a part of the population sees them as sacred symbols and spirituality important.

The high rate of recognition of the benefits attributed to macrofungi indicates that the participants have general knowledge of their utilitarian and cultural functions. Among the benefits mentioned, decomposition was the most recognized, suggesting that there is an understanding of the role of fungi in everyday life, which may be related to popular knowledge about food decomposition, wet surfaces, and diseases.

The fact that food is almost as recognized as decomposing demonstrates that edible mushrooms, such as "Paris mushrooms" (*Agaricus bisporus* (J.E. Lange) Imbach) and "shiitake" (*Lentinula edodes* (Berk.) Pegler), exotic species, are present in the food culture of many individuals. In addition, the potential use of fungi in the preparation of foods, such as yeast for bread, cheese production, and beverages, may have been recognized by the participants when answering this question. However, this area has great growth potential, considering the megadiversity of edible macrofungi available in Brazil, many of which are not commercially explored. According to Drewinski *et al*. (2024), 350 species of wild macrofungi safe for consumption and do not require additional preparation, but only a fraction of them are effectively cultivated and marketed. Many wild edible mushrooms are underutilized due to a lack of knowledge (Boa, 2004), including in several regions of Brazil (Menolli Jr. *et al*., 2025).

The perception of the medicinal benefit was also well scored by the participants, which may be related to their knowledge of the use of these organisms as dietary supplements, such as the "lion's mane mushroom" (*Hericium erinaceus* (Bull.) Pers.), which is widely used for its cognitive benefits, and antibiotics, such as penicillin (*Penicillium chrysogenum* Thom.).

Although widely recognized by participants, the medicinal benefits of macrofungi are most prominent in Eastern culture. According to Seethapathy *et al*. (2024), the Chinese medical literature recognizes mushrooms as both food and medicine and highlights their great potential for the development of innovative therapeutic drugs aimed at the treatment of various human diseases. In addition, these organisms have a wide range of bioactive properties, including antioxidant, anti-inflammatory, hepatoprotective, antiallergic, antibacterial, and antiviral effects. However, according to the same authors, in Brazil, studies on the medicinal use of macrofungi are still incipient, despite their great potential, considering the diversity of therapeutic compounds present in these organisms. Although less recognized, the benefit of macrofungi as biopesticides is promising. Studies such as that of Subramaniyan *et al*. (2023) state that some species of Basidiomycota have efficient biological properties in controlling mosquito vectors of the genera *Culex* (Linnaeus, 1758), *Anopheles* (Meigen, 1818) and *Aedes* (Meigen, 1818) and can be produced economically as a more ecological alternative and with less toxicity for nontarget organisms, reducing the unwanted effects of synthetic pesticides.

Similarly, the religious/spiritual benefits associated with the use of magic mushrooms, such as *Psilocybecubensis* (Ear.) Sing., although historically present in several cultures (Seethapathy *et al*., 2024), continues to be a topic surrounded by controversies and taboos, which may explain the low perception of this benefit. The prohibition of psychedelics in 1967 and widespread antidrug policies in the U.S. significantly

delayed debate and research on these substances. These compounds were classified by the 1967 United Nations Drug Convention, which legally defined them as having no accepted medical use, with maximum potential for harm and dependence. National legislation in several Western countries followed the UN schedule, resulting in the discontinuation of clinical focus and a decrease in research until it came to a near standstill in the late 1980s and 1990s (Rucker *et al*., 2018).

Interactions between people and macrofungi (questions 9-12, 14, 15)

Macrofungi are relatively well used, with 64.7% of respondents stating that they use mushrooms for various purposes. However, more than a third (35.3%) never use them, which suggests that a considerable part of the population may not be aware of their uses, access to these products or interest in using them—an issue that could be investigated further. Among the uses mentioned, the most common were food (63%; 189 responses), followed by gardening/ornamentation (10.7%; 32), recreational (12.3%; 37), medicinal (6.7%; 20) and ritual/spirituality (3%; 9 responses).

The high percentage of people who use mushrooms, especially in food, reflects the growing interest in these organisms in the human diet. Edible mushrooms, such as *Agaricus bisporus* (Paris mushrooms), *Pleurotus ostreatus* (Jacq.) P. Kumm. (shimeji) and *Lentinula edodes* (shiitake), are rich sources of protein, fiber, B vitamins, and bioactive compounds with antioxidant and anti-inflammatory properties (Kumar *et al*., 2021; Dong *et al*., 2022). In addition, the global trend of adopting plant-based diets has favored the popularization of mushrooms, owing to their flavor, texture, and high nutritional value, with significant amounts of protein, carbohydrates, fiber, and essential amino acids (Perez-Montes *et al*., 2021), despite not being vegetables.

Despite this, the significant share of people who do not use mushrooms can be attributed to cultural, economic, and educational barriers. Mycophobia and the fear of consuming mushrooms due to the risk of toxicity represent historical issues that still negatively influence their acceptance in several cultures (Kotowski, 2019). In Brazil, although mushroom consumption has increased in recent years, there is still a lack of familiarity with native species and their potential uses, which limits their presence in everyday food (Drewinski *et al*., 2024). In addition, the possible high cost associated with the production of commercial mushrooms, especially those outside São Paulo and Rio Grande do Sul, can be a limiting factor, making them less accessible to part of the population. According to Prado-Elias *et al*. (2024), knowledge passed down through generations is important for building a non-mycophobic community. They concluded that the absence of fungal uses in a rural community, which led to its classification as non-mycophilic, did not interfere with local knowledge about the ecology and conservation of macrofungi.

Although the frequency of responses to the use of mushrooms in gardening and ornamentation is relatively low, these uses demonstrate the decorative potential of macrofungi. Some species, such as the bioluminescent fungi of the genus *Mycena* (Pers.) Roussel, stand out for their beauty. However, the ornamental use of mushrooms is still not widespread, probably due to the ephemerality of their reproductive structures, which have a short life cycle, are fragile, and are sensitive to environmental variations, such as humidity and temperature. In addition, the lack of knowledge about the controlled cultivation of these species and the predominance of more durable ornamental plants on the market contribute to the low exploitation of this potential. Thus, scientific dissemination and landscape experimentation could expand the aesthetic appreciation of macrofungi, encouraging their ornamental use.

Although medicinal use was recognized as beneficial, it was not widely reported by the participants. This can be explained by cultural factors, since in Brazil, there is no consolidated tradition of using mushrooms in natura, as occurs in Europe and Eastern countries. Macrofungi are traditionally used in the folk medicine of European and Asian peoples as food supplements, mainly for their medicinal properties. Among the most well-known species are *Ganoderma* P. Karst., *Auricularia* Bull. ex Juss, *Grifola* Gray, *Phellinus* Quél.,

Coprinus Pers., *Trametes* Fr., *Lentinula* Earle, *Agaricus* L., *Inonotus* P.Karst. and *Pleurotus* (Fr.) P. Kumm., whose consumption is associated with treatment, disease prevention, and longevity (Reis, 2015).

In comparison with question eight, which asks about the benefits, "magical" use was more associated with recreational use than with ritualistic use. This suggests that although the mushroom is used for spiritual purposes, few people seem to associate it with a specific religion, cult, or rite. Although these uses are less expressive, they indicate the persistence of traditional knowledge about the psychedelic properties of some species or trend. Currently, psilocybin, a psychedelic compound found in several "magic mushrooms", mainly of the genus *Psilocybe* (Fr.) P. Kumm., is being studied for its therapeutic potential in mental health. According to Souza (2019), this substance has low toxicity, does not cause significant mental or physical damage, and has no potential for addiction or abuse. It has great potential for the treatment of depression in a short period of time, with prolonged effects even at small doses, and can also be used to treat other mental disorders, such as anxiety, obsessive-compulsive disorder and drug abuse. Despite its promising potential, the author points out that this topic is still rarely addressed in the Brazilian academic environment, which reveals an area with great potential for study and expansion. These findings suggest that psychedelic-assisted psychotherapy may be an important tool in the fight against mental disorders.

Direct interaction with macrofungi is limited: only 21.3% reported having had many direct contacts with these organisms, whereas 51.3% reported little contact, 17.7% reported no contact, and 9.7% did not remember (Figure 3). In addition, 16% of the participants were very afraid of touching macrofungi; 52% said they would touch it carefully, with moderate fear; 8.3% had never considered it, indicating indifference; and only 23.7% would touch it without fear (Figure 3).

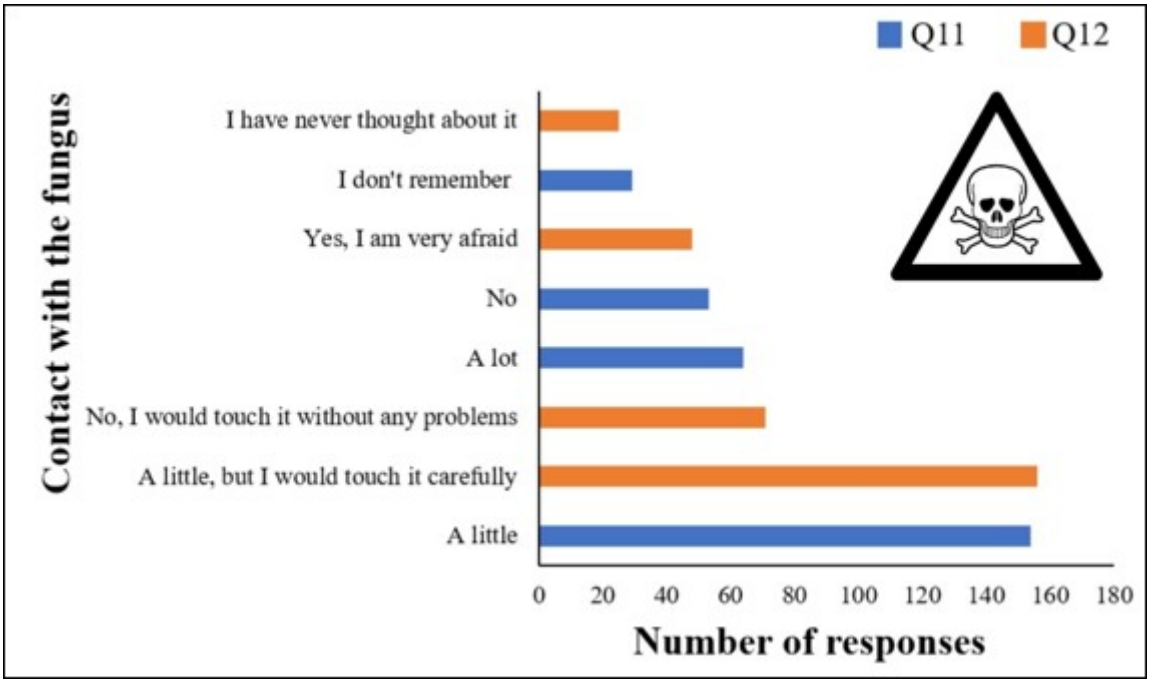


FIGURE 3
Question 11 (Have you ever had direct contact with any type of mushroom in nature?) and 12 (Would you have any fear of touching mushrooms that are found in nature?) of the questionnaire on people's perceptions of macrofungi was carried out from 10/14/2024 to 12/04/2024 in Brazil.
Source: Prepared by the authors (image: Canva).

This fear reflects both a lack of knowledge about fungi and a negative cultural perception associated, probably with their toxicity. One of the main factors fueling this distrust is the presence of wild toxic species, some of which can be mistaken for edible mushrooms. For example, *Chlorophyllummolybdites* (G. Mey.) Massee, popularly known as the "deadly parasol" or "false Macrolepiota", is one of the macrofungi most

frequently associated with cases of food poisoning in Brazil, especially in the South Region, where there is a growing number of records of hospitalizations due to accidental consumption (Soares *et al*., 2024).

However, there is a consensus in the scientific community, and it is important to clarify that the simple act of touching a mushroom does not represent a risk of intoxication and that there is no evidence of intoxication by touch. Unlike some poisonous plants that release toxins through contact, macrofungi do not have mechanisms that allow the cutaneous absorption of their toxic substances. Therefore, the fear of direct contact is unfounded and may be the result of widespread misinformation.

Interestingly, in question 14, concerning the destruction of fruiting bodies out of fear, 56 (18.7%) had been destroyed frequently, 20 (6.7%) had been destroyed only a few times and 5 people (1.7%) admitted to having destroyed many. However, the vast majority (219; 73%) do not destroy. Given these data, 27% of the participants had already destroyed these structures due to stigmas related to these organisms. This behavior may be related to the idea addressed in Question 15 that all wild mushrooms are toxic or hallucinogenic, a belief held by 15.3% of the interviewees, although the majority (84.7%) disagreed with this statement.

This problem indicates the possibility of intervention in the scope of environmental education for the conservation of this group of organisms and their permanence in the environment. Studies suggest that the insertion of more in-depth teaching about fungi in schools may be a solution. For example, for Cavalcante *et al*. (2021), it is necessary to expand the understanding and public perception of fungi from basic education through educational projects that promote awareness and encourage ethical and responsible attitudes toward these organisms. Therefore, greater knowledge and engagement of the population in relation to fungi and their role in the environment would result in their appreciation, reduction of cultural stigmas and, consequently, preservation.

Emotions and evaluation of macrofungi (questions 13, 16, 19)

The data show that most of the interviewees like mushrooms: 179 people (59.7%) say they like it, and 85 (28.3%) like it "a little", whereas 35 (11.7%) do not like it, and only one answered that they hate it. These data contradict the statement by Fidalgo (1968) that Brazil is a mycophobic country. This result may be related to the increase in the number of citizen science projects carried out by different researchers, which have been essential for expanding society's knowledge of the diversity of macrofungi. For example, the Mushrooms of Brazil (https://www.facebook.com/groups/CogumelosDoBrasil) project, a virtual group created on the social network Facebook, shares photographs of different fungi useful in everyday life. In addition, digital platforms such as iNaturalist platforms (https://www.inaturalist.org/) have also been popularized, raising awareness and integrating the diversity of fungi into the population. However, there may be sampling bias, which could be better investigated in future studies.

When looking at an image of a macrofungi, most participants reported positive feelings such as curiosity (234 responses), the perception of beauty (185), happiness (59), and fascination (5). On the other hand, negative emotions, such as fear (19) and disgust (11), were less common (Figure 4). Only 3 people said they felt indifferent to macrofungi, and 5 expressed a desire to eat.

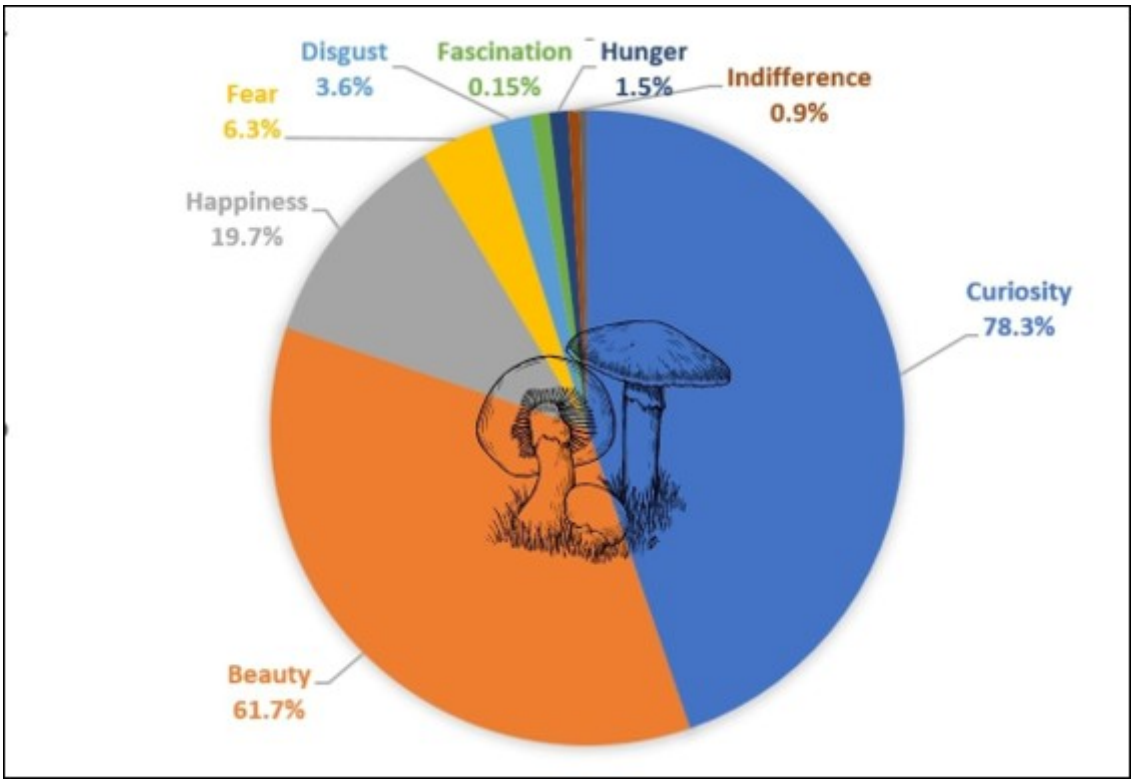


FIGURE 4
Question 16 (Choose words that best express your reaction when you see a macrofungi such as this in the image below) of the questionnaire on people's perception of macrofungi carried out from 10/14/2024 to 12/04/2024 in different cities in Brazil.
Source: Prepared by the authors (image: Canva).

However, with respect to the valorization of macrofungi, 149 (49.7%) of the participants considered that mushrooms are undervalued, 110 (36.7%) believed that they are valued in a limited way, and only 8 (2.7%) considered them highly valued, demonstrating that, in the popular view, mushrooms are undervalued. These results indicate that there is an awareness of the valuation of macrofungi, which may be stimulated by the curiosity that social networks generate in relation to these organisms. Thirty-three (11%) of the participants did not know how to answer. Citizen science, initiated by various institutions, together with the extension projects carried out by them, may expand the knowledge about the importance and ecosystem value that these organisms offer to society. In a study conducted by Trierveiler-Pereira *et al*. (2022), it was evident how virtual groups on social networks represent an important information tool for the evolution of society's scientific knowledge.

Contributions of macrofungi to quality of life (questions 17, 18)

In question 17, the participants demonstrated that they recognized the contributions of macrofungi to quality of life, with 87% stating that they recognized them and only 13% not. In addition, in question 18, regarding the perceived benefits (Figure 5), the answer "provision of ecosystem services" (80.3%) stood out, followed by "protection of natural resources for medicine and food" (71.9%) and "preservation of biodiversity" (56.3%). In smaller numbers, "ornamentation" (32%) and "spirituality" (16%) were mentioned. In this second instance, only 6.3% did not recognize any contribution of macrofungi. This discrepancy between questions 17 and 18 demonstrates that, when selecting the possible contributions listed in the questionnaire responses, participants may have changed their opinions and chosen a benefit associated with fungi.

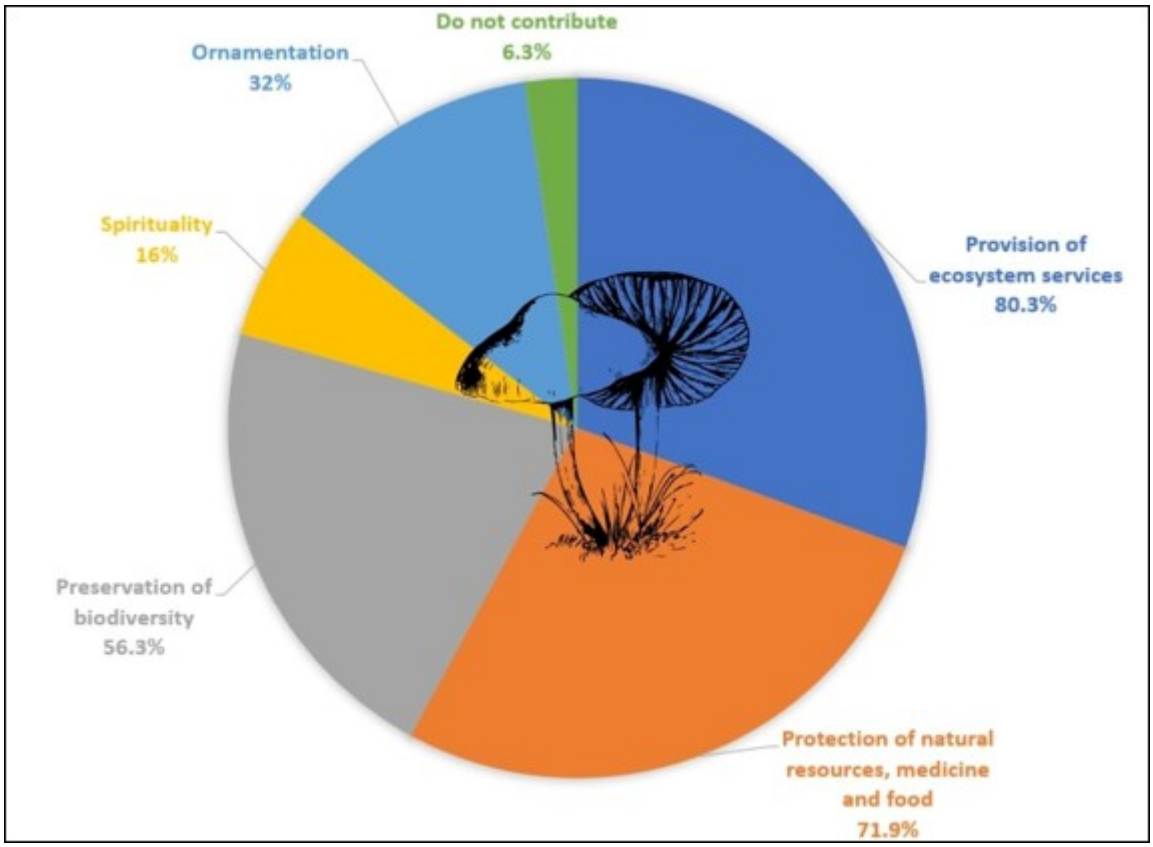


FIGURE 5

Question 18 (In what ways do you believe that macrofungi contribute to people's quality of life?) of the questionnaire on people's perceptions of macrofungi was carried out from 10/14/2024 to 12/04/2024 in Brazil. Source: Prepared by the authors (image: Canva).

Incentive to the conservation of macrofungi (question 20)

With respect to the protection of macrofungal biodiversity, 62.7% of the participants reported support, whereas 36.7% were indifferent, and only 0.7% opposed the idea that they hated mushrooms. These results highlight the need for educational strategies that expand the understanding of the role of macrofungi in the maintenance of ecosystems and in the quality of human life. Connecting these perceptions to conservation initiatives is critical, as it demonstrates how awareness and appreciation of these organisms can foster not only environmental protection but also community engagement for the sustainability and success of these forms of life. This finding reinforces the importance of integrating popular knowledge and formal education, facilitating the formulation of public policies aimed at valuing and using macrofungi sustainably.

Over the years, the advancement of studies in mycology has stood out precisely because of the relevance of fungi in the conservation of ecosystems (David *et al*., 2025). In addition, the interaction of local communities with macrofungi is of paramount importance for the preservation of biodiversity, with cultural and livelihood impacts. New ethnomycological studies can promote greater public awareness of the importance of conserving these organisms, especially in *ex situ* preservation initiatives (David *et al*., 2025).

Fungi are also allies in the fight against global hunger. In the review carried out by Cirlincione *et al*. (2023), several studies highlighted the use of fruiting bodies to increase the nutritional value and availability of vitamins in foods, transforming them into "superfoods". Thus, the importance of studies focused on the sociocultural ecosystem services offered by macrofungi is reinforced.

CONCLUSIONS

Although there are a lack of knowledge and some fear in relation to macrofungi, the associations of these organisms with negative feelings and toxicity are not predominant, even in the presence of cultural stigmas. Most of the interviewees expressed a liking for macrofungi, associating them with beauty, curiosity and positive perceptions regarding their usefulness and the environmental role they play. This scenario points to a promising path in the field of environmental education and the valorization of these organisms. However, it is important to highlight that approximately 37% of the participants showed indifference toward the conservation of this group, which is worrying. This attitude, combined with ignorance or fear, may be related to behaviors such as the destruction of fruiting bodies, which are essential structures for the reproduction and dispersion of these organisms. In addition, a perception of low social value of macrofungi and limited support for economic incentives related to them was observed, which suggests that these organisms still occupy a secondary place in conservation agendas and in the environmental awareness of the population. In view of this, it is essential to integrate macrofungi more effectively into environmental education programs, with the aim of expanding their social acceptance and reinforcing their importance for the conservation of biodiversity.

Agradecimientos

The authors thank the participants from the general Brazilian population for completing the questionnaire and participating in this study. The data for this study were obtained through informed consent. No personal data of the interviewees were used.

LITURATURE CITED

Anonymous. 1955. *Shen Nong materia medica, 102-200 AD* (E. Reprinted). People's Hygiene Press, Beijing, Han.

Boa, E.R. 2004. *Wild edible fungi: a global overview of their use and importance to people*. Rome: Food and Agriculture Organization of the United Nations. 145p.

Buller, A.R. 1914. The fungus lore of the Greeks and Romans. *Transactions of the British Mycological Society* 5: 21-66. https://doi.org/10.1016/S0007-1536(14)80007-7

Calaça, F.J.S., D.G. Sousa, J.S. Belém-Junior, R.C.P. Faquim, S. Xavier-Santos, C.M. Silva-Neto and M.M.O. Souza. 2021. Percepção de agricultores do Cerrado sobre os fungos. *Brazilian Journal of Biology* 82: e236219. https://doi.org/10.1590/1519-6984.236219

Carrión, N.C. 2023. "Micología en Ruedas": a lesson plan to increase awareness of mycology in K-12 classrooms. *The Plant Health Instructor* 23. https://doi.org/10.1094/PHI-L-2022-11-0006

Cavalcante, F.S., M.C.C. Campos and J.P.S. de Lima. 2022. A percepção ambiental sobre fungos: uma revisão integrativa. *Novos Cadernos NAEA* 24(3): 81-98.

Cavalcante, F.S., A.Y.G. Mendoza, O.S. de Moura, M.C.C. Campos and J.P.S. de Lima. 2022. Etnomicologia no sudeste da Amazônia: conhecimento e informação. *Revista Valore* [S. l.] 7: e-7023. https://doi.org/10.22408/reva702022978e-7023

Chang, R. 1996. Functional properties of edible mushrooms. *Nutrition Reviews* 54(11): S91. https://doi.org/10.1016/S0899-9007(00)00341-5

Cirlincione, F., G. Venturella, L. Settanni, L. and L. Barros. 2023. *Use of Medicinal mushrooms in the preparation of "Superfoods" for sustainable nutrition and human health*. Doutorado (Biodiversity in Agriculture and Forestry) - Università Degli Studi Di Palermo. Itália. 171p. https://tesidottorato.depositolegale.it/bitstream/20.500.14242/172166/1/Tesi%20Fortunato%20Cirlincione%20def.pdf

Cruz-Lorenso, M.F., J.A.C. Casanova and F. Ruan-Soto. 2025. Estudio etnomicológico de la comunidad de Chancah Veracruz, Quintana Roo, México. *Scientia Fungorum* 56: e1474. https://doi.org/10.33885/sf.2025.56.1474

Dejene, T., M. Semere, D. Gebeyehu, Y. Yohannes and P. Martín-Pinto. 2025. Ethnomycology of Yayo Coffee Forest Biosphere Reserve, southwest Ethiopia. *Forest Systems* 34(3): 21034-21034. https://doi.org/10.5424/fs/2025343-21034

David, L.G., J. De Souza Aguiar, F.F.B. Prestes, V.M.B. Nascimento, L.N. Resende; F.S.A. Cavalcante, ... and O.S. de Moura. 2025. Diversidade e importância dos Macrofungos em Unidades de Conservação no Brasil: Uma revisão bibliográfica integrativa dos últimos nove anos (2015-2024). *Educamazônia-Educação, Sociedade e Meio Ambiente* 18(1): 546-561.

Dong, Y., R. Miao, R. Feng, T. Wang, J. Yan, X. Zhao, ... and J. Zhao. 2022. Edible and medicinal fungi breeding techniques, a review: Current status and future prospects. *Current Research in Food Science* 5: 2070-2080. https://doi.org/10.1016/j.crfs.2022.09.002

Dos Reis, M.J., L. Leonardo-Silva and S. Xavier-Santos. 2024. The perception of fungi among Karajá indigenous children and adolescents from Brazil. *Journal of Ethnobiology and Ethnomedicine* 20(1): 16. https://doi.org/10.1186/s13002-024-00652-5

Drewinski, M.P., M.P. Corrêa-Santos, V.X. Lima, F.T. Lima, M. Palacio, M.E.A. Borges, ... and N. Menolli. 2024. Over 400 food resources from Brazil: evidence-based records of wild edible mushrooms. *IMA Fungus* 15(40). https://doi.org/10.1186/s43008-024-00171-8

Fatur, K. 2021. Peculiar plants and fantastic fungi: An ethnobotanical study of the use of hallucinogenic plants and mushrooms in Slovenia. *PLOS One* 16(1): e0245022. https://doi.org/10.1371/journal.pone.0245022

Ferreira, L.D. and R.A. Lima. 2022. Cegueira Micológica em uma Escola Pública no Município de Humaitá - AM. *Revista de Ensino*, *Educação e Ciências Humanas* 23(3): 433-437. https://doi.org/10.17921/2447-8733.2022v23n3p433-437

Fidalgo, O. 1968. Conhecimento micológico dos índios brasileiros. *Revista de Antropologia* 15/16: 27-34. https://www.jstor.org/stable/41615825

Goes-Neto, A. and F.P. Bandeira. 2003. A review of the Ethnomycology of indigenous people in Brazil and its relevance to ethnomycologycal investigation in Latin America. *Revista Mexicana de Micología* 17: 11-16. https://hdl.handle.net/20.500.14330/PER01000236596

Gomes, B.S. 2022. Análise do processo de ensino e aprendizagem sobre os fungos em livros didáticos do Ensino Médio. *Scientific Electronic Archives* 15(5). https://doi.org/10.36560/15520221542

Guzmán, G. 2001. Hallucinogenic, Medicinal, and Edible Mushrooms in Mexico and Guatemala: Traditions, Myths, and Knowledge. *International Journal of Medicinal Mushrooms* 3: 399-408. https://inecol.repositorioinstitucional.mx/jspui/handle/1005/105

Guzmán, G. 2008. Hallucinogenic mushrooms in Mexico: An overview. *Economic Botany* 62: 404-412. https://doi.org/10.1007/s12231-008-9033-8

Guzmán, G. 2011. El uso tradicional de los hongos sagrados: Pasado y presente. *Etnobiología* 9: 1-21.

Guzmán, G. 2024. *Fungi in the Maya Culture: past, present, and future. In The lowland Maya area* (pp. 315-325). CRC Press.

Haro-Luna, M.X., F. Ruan-Soto, V. Ramírez-Cruz, J. Amaya-Pérez and L. Guzmán-Dávalos. 2025. Current use of holy mushrooms of the genus Psilocybe in a Zapotec community in Oaxaca, Mexico. *IMA fungus* 16: e148070. https://doi.org/10.3897/imafungus.16.148070

Hellwig, C., H. Moshtaghuan, D. Persson, K. Bolton, K., K. Rousta and G. Häggblom-Kronlöf. 2024. Glocal and ecoethical perceptions of engagement with fungi-based food. *Journal of Cleaner Production* 440: 140898. https://doi.org/10.1016/j.jclepro.2024.140898

Ishikawa, N.K., R. Vargas-Isla, R.S. Chaves and T.S. Cabral. 2012. Macrofungos da Amazônia: importância e potencialidades. *Ciência & Ambiente* 44: 129-139. https://repositorio.inpa.gov.br/handle/1/21914

Kaaronen, R.O. 2025. Living in the Mycelial World: A global cross-cultural ethnomycological review. *Topics in Cognitive Science* 00: 1-46. https://doi.org/10.1111/tops.70003

Kotowski, M. 2019. History of mushroom consumption and its impact on traditional view on mycobiota – an example from Poland. *Microbial Biosystems* 4(3): 1-13. https://doi.org/10.21608/mb.2019.61290

Krikorian, A.D. 1978. Food: The Gift of Osiris. *Economic Botany*. (pp. 219-221), vol. 32, N 3.

Kumar, K., R. Mehra, R.P.F. Guiné, M.J. Lima, N. Kumar, R. Kaushik, N. Ahmed, A.N. Yadav and H. Kumar. 2021. Edible mushrooms: A comprehensive review on bioactive compounds with health benefits and processing aspects. *Foods* 10(12): 1-22. https://doi.org/10.3390/foods10122996

Larsen, J., P. Jaramillo-López, M. Nájera-Rincon and E.C.E. González. 2015. Biotic interactions in the rhizosphere in relation to plant and soil nutrient dynamics. *Journal of Soil Science and Plant Nutrition* 15: 449-463. http://dx.doi.org/10.4067/S0718-95162015005000039

Melazo, G.C. 2005. Percepção Ambiental e Educação Ambiental: Uma reflexão sobre as relações interpessoais e ambientais no espaço urbano. *Olhares e Trilhas* 6: 45-51.

Menolli, N., L. Trierveiler-Pereira, D.C. Zied, F.D.O. Pereira, M.A. Sulzbacher, E.R. Drechsler-Santos, ... and M.P. Drewinski. 2025. El Cogumelos comestíveis no Brasil: estado atual do conhecimento, avanços e perspectivas. *Lilloa* 103-161. https://doi.org/10.30550/j.lil/1879

Miranda, N.M. and L.B. Souza. 2011. Percepção ambiental em propriedades rurais: Palmas (TO), Brasil. *Revista de Geografia da UFC* 10(23): 171-186. https://doi.org/10.4215/RM2011.1023.0013

Molina-Murillo, S.A., A.C.A. Rojas, S. Somerville, R.G. Doss and B. Lemus. 2015. What do you think of fungi? Perceptions by "educated" groups in Honduras and Costa Rica. *Brenesia* 83-84: 30-36. http://biblioteca.museocostarica.go.cr/articulo.aspx?id=6760&art=3606285

Moura, T.F. de. 2023. *Avaliação do conteúdo sobre a biologia dos fungos em livros de ensino médio*. Trabalho de conclusão de curso (Ciências Biológicas) - Universidade Santo Amaro – UNISA, Ouro Preto do Oeste, RO. 17p. http://dspace.unisa.br/handle/123456789/2516

Oliveira, T.C., C.P. Silva, T.E. Andrade, R.F. Santos, A.S. Lima and J.R. Rocha. 2016. Percepção de macrofungos por estudantes de uma escola pública no nordeste do Brasil. Ensino, *Saúde e Ambiente* 9(3): 54-63, 2016

Palanisamy, S., T.M. Murugesan, M. Palaniappan, C. Santulli and N. Ayrilmis. 2023. Use of hemp waste for the development of mycelium-grown matrix biocomposites: A concise bibliographic review. *BioResources* 18(4): 8771-8780. https://doi.org/10.15376/biores.18.4.Palanisamy

Perez-Montes, A.P., E. Rangel-Vargas, J.M. Lorenzo, L. Romero and E.M. Santos. 2021. Edible mushrooms as a novel trend in the development of healthier meat products. *Current Opinion in Food Science* 37: 118-124. https://doi.org/10.1016/j.cofs.2020.10.004

Prado-Elias, A., N. S. Almeida, F. Ruan-Soto, J.M. Baltazar and L. Trierveiler-Pereira. 2024. Não dá muda, não dá semente, como cresce?": conhecimento etnomicológico de uma comunidade rural caipira no Sudoeste Paulista. Gaia Scientia 17: 74-96. https://doi.org/10.22478/ufpb.1981-1268.2023v17n2.65378

Rachid, C.T.C.C., F.C. Balieiro, E.S. Fonseca, R.S. Peixoto, G.M. Chaer and J.M. Tiedje. 2015. Intercropped silviculture systems, a key to achieving soil fungal community management in Eucalyptus plantations. *PLOS One* 10: e0118515. https://doi.org/10.1371/journal.pone.0118515

Reis, M.F. dos. 2015. Cogumelos medicinais: uma revisão sobre compostos bioativos e efeitos biológicos. *SaBios-Revista de Saúde e Biologia* 10(1): 149-164

Rios-Garcia, U., A. Carrera-Martinez, M. Martinez-Reyes, F. Hernandez-Santiago, F.R. Evangelista, I. Diaz-Aguilar, ... and J. Perez-Moreno. 2023. Traditional knowledge and use of wild mushrooms with biocultural importance in the Mazatec culture in Oaxaca, Mexico, cradle of the ethnomycology. Forest Systems 32(1): e007.

Rojas, A.C., S. Molina-Murillo and R.G. Doss. 2019. Perceptions of the use and value of fungi by two groups of young adults from Central America. *Cuadernos de Investigación UNED* 11(3): 345-351. https://doi.org/10.22458/urj.v11i3.2619

Rosa, M., A. D'Aquino and A. Mohr. 2010. Os fungos na escola: análise dos conteúdos de micologia em livros didáticos do ensino fundamental de Florianópolis. *Experiências em Ensino de Ciências* 5(3): 90-98.

Ruan-Soto, F., R.M. Méndez, J. Cifuentes and F. Limón. 2007. Nomenclatura, clasificación y percepciones locales acerca de los hongos en das comunidades de la Selva Lacandona, Chiapas, México. *Etnobiología* 5: 1-20.

Ruan-Soto, F., Caballero, J., Martorell, C., Cifuentes, J., González-Esquinca, A. R. and Garibay-Orijel, R. 2013. Evaluation of the degree of mycophilia-mycophobia among highland and lowland inhabitants from Chiapas, Mexico. *Journal of Ethnobiology and Ethnomedicine* 9(1): 36. https://doi.org/10.1186/1746-4269-9-36

Ruck, C.A. 1981. Mushrooms and philosophers. *Journal of Ethnopharmacology* 4(2): 179-205.

Ruck, P. and C. Anton. 2016. Mushroom Sacraments in the Cults of Early Europe. *NeuroQuantology* 14(1). https://revistaetnobiologia.mx/index.php/etno/article/view/257

Rucker, J.J.H., J. Iliff and D.J. Nutt. 2018. Psychiatry & the psychedelic drugs. Past, present & future. *Neuropharmacology* 142: 200-218. https://doi.org/10.1016/j.neuropharm.2017.12.040

Seethapathy, P., T. Subramani, N. Ayrilmis and H. Patil. 2024. Therapeutic and environmental potential of mushrooms in ancient and modern contexts: A review. *International Journal of Medicinal Mushrooms* 27. https://doi.org/10.1615/IntJMedMushrooms.2024057764

Silva, T.C.; L. da S. Chaves and U.P. Albuquerque. 2016. What is environmental perception? In: Albuquerque, U., R.N. Alves (eds). *Introduction to Ethnobiology*. Springer, Cham. 93-97p. https://doi.org/10.1007/978-3-319-28155-1_14

Silva, A. da C. and A.M.S. Gouw. 2021. Percepções e conhecimentos dos estudantes sobre fungos. *Scientia Plena* 17(6). https://doi.org/10.14808/sci.plena.2021.064401

Singh, D., M.A. Bagwai, R. Bhari and R.S. Singh. 2025. Fungi in solid waste management and material recycling. In: Singh, D., R. Bhari. *Fungal Biotechnology*. Academic Press., 24: 619-654. https://doi.org/10.1016/B978-0-443-13263-6.00024-9

Sousa, S.B. de, J. de R. de S. Rocha, R.F.P. Lucena and R.F.M. de Barros. 2017. Percepção sobre os macrofungos em uma comunidade rural na Caatinga, Nordeste do Brasil. *Gaia Scientia* [S. l.], 11(2): 231-241.

Souza, J. 2019. *A psilocibina e o seu potencial terapêutico em saúde mental*. Trabalho de Conclusão de Curso (Enfermagem) - Universidade Federal do Ceará. 50p. http://repositorio.ufc.br/handle/riufc/46077

Soares, D.M., M.D.F. SANTANA and E.S.M. Canto. 2024. New occurrence data of the toxic mushroom Chlorophyllum molybdites (Basidiomycota, Agaricaceae) in the Brazilian Amazon region. *Acta Amazonica* 54(n. spe1). https://doi.org/10.1590/1809-4392202300482

Spiers N, B.C. Labate, A.O. Ermakova, P. Farrell, O.S.G. Romero, I. Gabriell and N. Olvera. 2024. Indigenous psilocybin mushroom practices: An annotated bibliography. Journal of Psychedelic Studies 8(1): 3-25. https://doi.org/10.1556/2054.2023.00297

State of the World's Plants and Fungi. 2023. Royal Botanic Gardens Kew. *Tackling the Nature Emergency: Evidence, gaps and priorities*. 96p.

Subramaniyan, S., G. Pathalam, E.H. Varghese, C. Tamilselvan, M.K. Mariappan and I. Savarimuthu. 2023. Mushrooms (basidiomycetes) as source of mosquito control agents. *Journal of Natural Pesticide Research* 5: 100044-100044. https://doi.org/10.1016/j.napere.2023.100044

Trierveiler-Pereira, L., J.S. Cardoso, A. Prado-Elias, M.A. Neves and F. Karstedt. 2022. Cogumelos do Brasil e a Ciência Cidadã na divulgação da funga brasileira. *Journal of Education Science and Health* 2(3): 1-16. https://doi.org/10.52832/jesh.v2i3.142

Wasson, R.G. 1980. The wondrous mushroom: Mycolatry in Mesoamerica. *Ethnomycological*, N. 7. Studies McGraw-H ill: New York. 248p. https://doi.org/10.1080/02791072.1981.10471458

Wu, F., L.W. Zhou, Z.L. Yang, T. Bau, T.H. Li and Y.C. Dai. 2019. Resource diversity of Chinese macrofungi: edible, medicinal and poisonous species. *Fungal Diversity* 98: 1-76. https://doi.org/10.1007/s13225-019-00432-7

Zedda, L. and G. Rambold. 2015. The diversity of lichenised fungi: Ecosystem functions and ecosystem services. In: Upreti, D., P. Divakar, V. Shukla, R. Bajpai (eds). *Recent Advances in Lichenology*. Springer, New Delhi. 2: 121-145. https://doi.org/10.1007/978-81-322-2235-4_7

Zent, E.L., S. Zent and T. Iturriaga. 2004. Knowledge and use of fungi by a mycophilic society of the Venezuelan Amazon. *Economic Botany* 58(2): 214-226. https://doi.org/10.1663/0013-0001(2004)058[0214:KAUOFB]2.0.CO;2

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