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RESEARCH ARTICLE

Wild edible mushrooms used by the Mudugar tribe of Attappady, Kerala: An ethnomycological study with a review of pharmacological properties

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Abstract

The study investigated twelve edible mushrooms traditionally used by the Mudugar tribe in Attappady, Kerala, focusing on their cultural significance, traditional uses and potential medicinal and pharmacological properties through the documentation of indigenous knowledge. Ethnobotanical methods, like semi-structured interviews and participatory observations, were used to collect qualitative data on the Mudugar tribe's perceptions, cultural values and usage patterns of these wild mushrooms. To quantify cultural significance and traditional knowledge, indices such as Mention Index (MI) and Cultural Significance Index (CS) were utilized. Additionally, the pharmacological potential of these mushrooms was assessed by correlating traditional uses with existing scientific literature. The analysis identified specific mushrooms (*Termitomyces microcarpus, Termitomyces clypeatus, Termitomyces heimii*) as possessing high cultural value (indicated by elevated MI and CS score) and revealed their integral role in the Mudugar tribe's culinary practices. Additionally, traditional medicinal use, particularly of *Termitomyces* species and *Pleurotus flabellatus*, suggest potential pharmacological attributes. This study bridges the gap between traditional knowledge and scientific advancements, paving the way for future collaborations that can honour Mudugar wisdom and unlock the potential of these myco-treasures. While preliminary alignment with scientific literature points to possible immunomodulatory, antioxidant, anti-inflammatory and anticancer properties, rigorous pharmacological investigations are essential to substantiate these claims. The findings underscore the importance of conserving these mushrooms within the cultural and ecological practices of the Mudugar tribe in Attappady, Kerala.

Keywords: cultural significance; Mudugar tribe; traditional knowledge; wild edible mushrooms

Introduction

Ethnomycology is an interdisciplinary field that investigates the basic relationship between fungi and human cultures. By focusing on traditional knowledge related to edible wild mushrooms, it offers invaluable insights into cultural practices and ecological relationships. This discipline reveals hidden aspects of biodiversity, encourages sustainable resource management, elucidates the spiritual and symbolic significance of fungi within diverse communities (1-3). It also highlights the potential of incorporating innovative cultivation techniques inspired by mushrooms— such as those employed by the Baka Pygmies— into sustainable food production practices, thereby contributing to environmental conservation and enhancing the well-being of local communities (4). Furthermore, ethnomycological research underscores the remarkable medicinal potential of traditional knowledge; for instance, studies on *Ganoderma applanatum* have led to the discovery of six novel anticancer compounds (5, 6). Ultimately, the study and documentation of these traditional practices empower local communities, bridge knowledge gaps and foster scientific collaboration and innovation.

The Mudugar tribe of Attappady, Kerala, has developed a deep and profound understanding of the forest ecosystem through generations of harmonious coexistence. The study of their traditional knowledge-particularly regarding wild edible mushrooms-holds significance that transcends cultural preservation. It offers valuable insights into potential pharmacological resources by revealing the therapeutic applications of mushrooms within the Mudugar's traditional healthcare practices. The present study explores the cultural importance, traditional uses and potential pharmacological properties of wild mushrooms as utilized by the Mudugar community.

Materials and methods

Study site and tribal community

The study was conducted among the Mudugar tribe in Attappadi, located in the northeastern part of Palakkad district, Kerala (Fig. 1). This region forms part of the Western Ghats, a UNESCO World Heritage Site and one of the world's eight major biodiversity hotspots. Stretching along Indias' western coast, the Western Ghats are renowned for their rich ecological diversity, dense forests and verdant landscapes.

Attappadi is known for its scenic landscapes, tribal communities and its proximity to Silent Valley National Park and surrounding reserve forests. The Bhavani River, originating from the hills, further enhances the ecological significance and cultural heritage of the region. The area is home to various indigenous groups, adding to its distinct cultural identity (Fig. 2). Moreover, Attappadi plays a key role in conserving the biodiversity of the Western Ghats.

The Mudugar, who constitute approximately 10 % of the region's tribal population, live in remote forest settlements. They rely heavily on the land for shifting cultivation and foraging. Their distinct dialect blends elements of Telugu, Tamil and Malayalam with local linguistic features. The Mudugar are recognized for having the highest literacy rate among the local tribes and for preserving traditional practices, such as lighting the Malleswaran Peak on Sivaratri. Their extensive knowledge of wild mushrooms, passed down through generations, reflects a deep-rooted understanding of the local ecosystem.

Identification of wild edible mushrooms

Identification was carried out based on both morphological and microscopic characteristics, complemented by consultations of relevant literature, including published research papers, fungal compendia and checklists. Taxonomic names were further cross-checked using authoritative sources, including relevant literature and the Index Fungorum Database, to ensure accuracy.

Experimental design

The study included both qualitative and quantitative methodologies to gather and analyze traditional knowledge. Data and specimen collection were conducted between 2016 and 2019, following approvals from the Scheduled Tribe Development Department (D3-199/16) and the Chief Wildlife Warden, Kerala (WL-10 28665/16). Informed consent was obtained from tribal members and key knowledge holders (Appendix 1). Fieldwork was carried out in coordination with tribal development offices and tribal promoters across selected hamlets.

Regular visits helped build trust with the tribe, enabling detailed interviews using structured and semi-structured questionnaires (Appendix 2). Visual aids, like pictures and fresh specimens were used to assist identification and enhance understanding during group interviews. Key informants from the community were identified through the snowball sampling technique to gain further understanding into the medicinal attributes of mushrooms (7). Collaborative transect walks and collection trials involving these informants and tribal promoters (during the monsoon seasons) yielded in the collections of valuable specimens for detailed analysis.

Fig. 1. Study area-Attappadi.

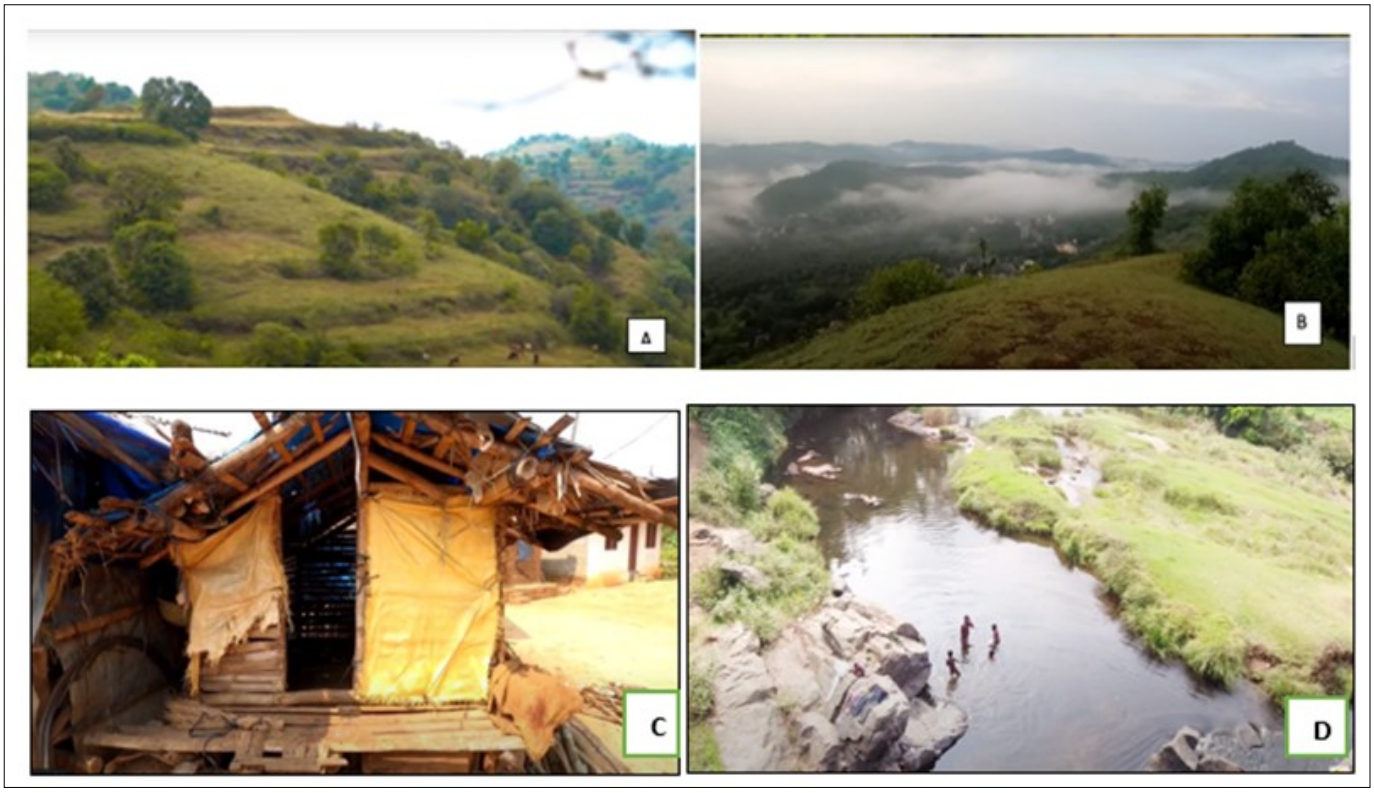

Fig. 2. A, B) Study sites; C) Tribal house; D) Bhavani river.

Appendix 1

Model questionnaire for preliminary survey on wild edible mushroom usage

1. Do you eat mushrooms?
2. Who in your family collects mushrooms? (Father/ Mother/ Children)
3. Who taught you about collecting mushrooms?
4. How many different species do you collect for food?
5. Please list the names and seasons of mushrooms used.
6. Which species tastes the best?
7. When and how often are the mushrooms collected (Never/Sometimes /Always) ?
8. How do people prepare mushrooms for food?
9. Who in your family prepares mushrooms for food?
10. Do you preserve mushrooms? (Yes/No)
11. Are mushrooms sold in the market places in this region? (Yes/No)
12. Do you use mushrooms for purposes other than for food, for instance as medicine? (Yes/No)
13. Which person may know more about the usage of mushroom as medicine?
14. Do you use any conservative methods to protect/ conserve the mushrooms? (Yes/No)

Appendix II

Informants consent form

I hereby give my full consent and conscience to participate in this study and declare that to the best of my knowledge the information that I provided are true, accurate and complete.

Date.... .. Signature/Thumb Impression

Informant's details:

Name .....

Gender .....

Age .....

Occupation .....

Residence .....

Data about medicinal mushroom and its use:

Local name .....

Habit .....

Availability: Easy/Difficulty/Very difficult

Conservation need or effort .....

Mode of collection and storage.....

Name of disease treated.....

Mode of preparation of drug .....

Mode of application .....

Other uses .....

Remarks: Fungi identified as .....(Binomial name)

Signature of Researcher .....

To quantify the cultural significance of each mushroom species, the CSI was used, adapted to emphasize the ethnomedicinal context (8, 9). The enhanced CSI incorporated seven sub-indices, including Traditional Ethnomedicinal Practice Index (TEMPI) and a modified Health Index (HI), which was assigned greater weight to reflect the significance of medicinal properties from the Mudugar's cultural perspective. Additionally, sub-indices like Perceived Abundance Index (PAI), Taste Score Food Appreciation Index (TSFAI), Multi-Functional Food Index (MFFI) and KTI, provided broader insights into cultural relevance and the transmission of traditional knowledge. The Conservation Efforts Index (CEI) assessed sustainable mushroom harvesting practices, while TEMPI evaluated perceived medicinal value, prioritizing species used for specific treatments as identified by key traditional knowledge holders.

The following equation was used to calculate the Weighted Ethnomedicinal Cultural Significance Index for each species:

WEM CSI Spi = (PAI+TSFAI+2xHI+MFFI+ KTI+CEI+3xTEMPI).

Mushroom species with a CSI score exceeding 45 were categorized as culturally significant and as potential functional foods (10).

Furthermore, the MI was used to assess the relative importance of identified and collected mushroom species based on the frequency of community mentions. An extensive review of scientific literature was also conducted to examine the pharmacological potential of these species, focusing on known bioactivities and possible therapeutic applications. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 24.0.

Results

A total of 23 edible mushroom species were identified and collected from Attappadi; however, the ethnomycological survey found that only 12 of these species are traditionally used by the indigenous tribes. Major collection sites included Padavayal, Narasimhamukku, Anawai, Mele Abbannoor and Mantham potti forest areas. *Termitomyces* species were observed across all sites and local tribes believe that their fructification is influenced by environmental factors such as rainfall, lightning and thunder. Ceratin *Pleurotus* species were limited to specific biodiversity-rich forest patches, particularly in the Anawai region. Their appearance closely followed the region's distinct monsoon cycles (Fig. 3), peeking from the pre-monsoon showers in May and extending through the north-east monsoon period (October to November). *Termitomyces* species, observed throughout the collection sites, are locally believed to fructify in abundance with rainfall accompanied by lightning and thunder. *Calocybe* and *Agaricus* species typically emerged during the onset of the monsoon showers.

The Mudugar tribes' classification of mushrooms reflects a deep ecological understanding of their forest environment. Rather than assigning species-specific names, they categorize mushrooms based on their growing substrates, using terms such as "marakkuka" for trees-growing species and "mannukkuka" for those growing on the ground. These classifications correspond with their observations of mushrooms habitat preferences. Furthermore, they often prefix the local tree name to distinguish specific mushrooms, for example, '*Pila marakuka'* found on *Artocarpus heterophyllus* and *'Murikku koon'* on *Erythrina variegata*. They consciously avoid mushrooms growing on *Holigarna arnottiana* (locally known as "Cheru maram"). Mudugar tribe prefers mushrooms found in association with specific tree species like 'Kattu-moochi' (*Mangifera indica*), 'Ayini maram' (*Artocarpus hirsutus*), 'Pokku maram' (*Mallotus tetracoccus*) and 'Vattakkanni' (*Macaranga peltata*) etc.

The initial survey documented the consumption of 12 wild edible mushroom species by the Mudugar tribe (Fig. 4), which belong to 6 fungal families. Pleurotaceae (3 species), Tricholomataceae (1 species), Agaricaceae (1 species), Polyporaceae (2 species), Lyophyllaceae (3 species) and Auriculariaceae (2 species) as represented in Table 1.

A subsequent quantitative study was undertaken to understand deeper into the cultural significance of wild mushrooms within the Mudugar tribe. This study utilized the CSI, along with several sub-indices, to assess the cultural importance attributed to specific wild mushroom species among the Mudugar community (Table 2).

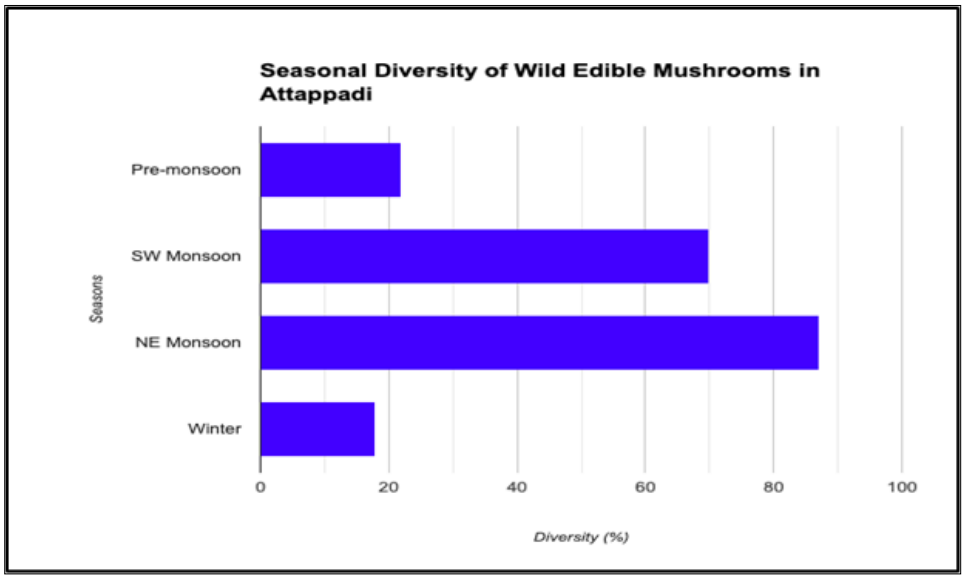

Fig. 3. Seasonal diversity of wild edible mushrooms.

Fig. 4. Wild edible mushrooms used by the Mudugar tribe. A) *Pleurotus otreatus;* B) *Pleurotus flabellatus;* C) *Pleurotus djamor; D) Termitomyces microcarpus;* E) *Termitomyces heimii;* F) *Termitomyces clypeatus;* G) *Agaricus campestris;* H) *Calocybe species;* I) *Auricularia auricula-judae;* J) *Auricularia delicata;* K) *Lentinus squarrosulus;* L) *Lentinus sajor-caju.*

Table 1. Name of wild edible mushrooms, abbreviations used and family

Mushroom name	Abbreviation	Family
Pleurotus flabellatus	PF	Pleurotaceae
Calocybe species	CI	Tricholomataceae
Pleurotus djamor	PD	Pleurotaceae
Pleurotus ostreatus	PO	Pleurotaceae
Agaricus campestris	AC	Agaricaceae
Lentinus sajor-caju	LSJ	Polyporaceae
Termitomyces microcarpus	TMF	Lyophyllaceae
Termitomyces clypeatus	TC	Lyophyllaceae
Termitomyces heimii	TH	Lyophyllaceae
Auricularia auricula-judae	AJ	Auriculariaceae
Auricularia delicata	AD	Auriculariaceae
Lentinus squarrosulus	LSQ	Polyporaceae

Table 2. Cultural significance analysis of wild mushrooms used by Mudugar tribe

WEM	PAI	TSFAI	MFFI	HI	KTI	CEI	TEMPI	CSI	MI	CSPI
TH	6.67	10	4.44	8.3	8.6	4.45	1.52	55.42	8	44.3
TMF	10	9.41	4.04	5.24	9.76	4.4	0.83	50.57	9.33	47.2
TC	10	9.86	3.74	6.11	9.3	3.75	0.42	50.14	9	45.1
PF	6.67	8.4	3.33	6.15	7.18	0	0.25	39.62	8.67	34.33
LSQ	10	4.1	6.67	5.13	6.67	0	0	37.70	4.33	16.3
CI	6.67	8.33	3.33	5.56	7.36	0	0	36.81	8	0
PD	6.67	8.4	3.33	5.8	6.09	0	0	36.09	7.67	27.6
AC	6.67	10	3.33	5.1	7.3	0	0	35.73	8.67	31
AD	3.33	5.18	3.7	7.4	7.78	0	0	35.19	3.33	11.7
PO	6.67	7.12	3.33	5.67	7.41	0	0	33.53	9	30.17
AJ	3.33	4.66	3.33	6.67	7.11	0	0	31.78	5	15.9
LSJ	6.67	4.70	3.33	3.18	6.82	0	0	27.88	7.33	20.4

The MI served as a scale for assessing the frequency with which specific mushroom species are collected or discussed by members of the Mudugar community. *Termitomyces microcarpus* attained the highest MI score of 10, signifying its widespread recognition and prevalent discussion among the community members. In contrast, *Auricularia delicata* recorded an MI score of ≤ 3.33, suggesting limited discussion or lower prevalence in their conversations. This variance in MI values sheds light on the varying degrees of attention and recognition given to different wild edible mushrooms among the Mudugar community, highlighting the differential cultural significance attached to each species.

The Perceived Abundance Index (PAI) provided an important measure of the relative prevalence and visibility of mushroom species in the region, as perceived by the Mudugar tribe. *Termitomyces microcarpus, Termitomyces clypeatus* and *Lentinus squarrosulus* emerged as the most commonly encountered species, each receiving the maximum PAI score of 100 %. Other species showed varying levels of perceived abundance, ranging from moderately common (6.67 %) to universally prevalent (100 %) in community discussions.

The Taste Score Food Appreciation Index (TESFAI) showed that *Termitomyces* are cherished for their distinct taste, which significantly enhances the flavor of traditional Mudugar dishes. *Termitomyces heimii* and *Agaricus campestris* were especially appreciated for their delicate yet robust flavors. Additionally, *Termitomyces clypeatus* and *T. microcarpus* received high taste scores, further underscoring their prominent role in the tribe's culinary traditions.

The KTI showed a strong continuity of traditional knowledge, especially for Termitomyces species, which recorded KTI values ≥ 8.5. This suggests that detailed knowledge regarding the identification, habitat, collection and culinary use of these mushrooms has been well-preserved and passed down through at least four generations. This rich mycological knowledge reflects the tribes' long-standing interaction with their forest environment.

The CEI the Mudugar tribes' commitment to sustainable harvesting practices. Informants described specific actions, such as leaving a portion of mushrooms unharvested, selectively collecting only mature specimens and protecting the surrounding habitat. These practices were particularly observed during the collection of *Termitomyces* species, which are culturally significant and ecologically important.

Regarding perceived health benefits, the HI scores ranged from 3.18 (*Lentinus squarrosulus*) to 8.3 (*Termitomyces heimii*). Despite the limited scientific knowledge of the medicinal properties, *Termitomyces* species and *Pleurotus flabellatus* are highly valued by the community for their perceived ability to enhance immunity and address various health concerns.

CSI values ranged from 27.88 (*Lentinus sajor-caju*) to 55.42 (*Termitomyces heimii*), highlighting the cultural importance of these fungi. Other mushrooms with high CSI values include *Schizophyllum commune* (51.12), *T. microcarpus* (50.57) and *T. clypeatus* (50.14). In contrast, the Cultural Preference Index (CPI) varied from 4.2 (*T. microcarpus*) to 11.7 (*Auricularia delicata*), indicating varying levels of personal or communal preference.

Overall, the study revealed the intricate relationship between the Mudugar tribe and wild edible mushrooms. Their extensive ethnomycological knowledge, sustainable practices and evolving understanding of the health and cultural significance of these fungi provide valuable insights into human-fungal interactions and underscore the importance of preserving traditional ecological knowledge.

Nutritional and pharmacological potential of mushrooms

Wild edible mushrooms used by tribal communities such as the Mudugars of Attappadi, Kerala, are known not just for their taste but also for their health benefits. These mushrooms are collected from rich forest areas based on traditional knowledge passed down through generations. The Mudugar people choose certain species based on their flavour, availability and believed therapeutic properties. Increasingly, scientific research is corroborating many of these traditional beliefs, demonstrating that such mushrooms may possess antioxidant, antimicrobial, antidiabetic and immune-modulatory properties. This section presents an overview of the nutritional composition and medicinal potential of mushrooms traditionally utilized by the

Mudugar tribe, integrating ethnographic observations with contemporary scientific findings.

Studies have shown that many of the mushrooms consumed by the Mudugar community are rich in essential vitamins, minerals and dietary fiber, making them a valuable component of a balanced diet across various populations (11). *Termitomyces* species are notable for their high protein content (19 %) and significant fiber content (18.45 %) (12). In contrast, dried *Pleurotus* species exhibit an even higher protein concentration (25.91 %) but lower fiber content (10.41 %) (13). *Auricularia* species, while having the lowest protein level (3.5 %), are distinguished by their exceptionally high carbohydrate content (81 %) (14). Among these, *Agaricus* species possess the highest protein concentration (36.6 %), whereas Calocybe has the lowest (15 %) (15). Additionally, wild mushrooms commonly consumed by the Mudugar are typically low in calories and fat, making them beneficial for weight management and cardiovascular health.

Notably, *Termitomyces* species are particularly rich in vitamin D, an essential nutrient for bone health and immune function. These nutritional attributes underscore the role of wild mushrooms as a valuable dietary resource and support their traditional use among the Mudugar. Their diverse nutritional profile not only sustains local food practices but also offers global insights into the potential of wild fungi to enhance human nutrition and promote health (16). It is thus unsurprising that these mushrooms have long been esteemed by the Mudugar community.

Beyond their nutritional value, certain wild mushrooms are increasingly recognized for their medicinal potential due to the presence of diverse bioactive compounds (Fig. 5). *Termitomyces* species, including *T. microcarpus*, *T. clypeatus* and *T. heimii*, are particularly notable for their nutritional richness and the wide array of biologically active constituents they contain. These mushrooms are rich in antioxidants, possess antimicrobial and antiproliferative properties and show considerable promise in the fields of health and nutrition (17, 18). Furthermore, *Termitomyces* species contain polysaccharides such as β-glucans, lectins and various secondary metabolites, which contribute to their immunomodulatory activity.

Pleurotus species-specifically *Pleurotus flabellatus*, *P. djamor* and *P. ostreatus*-also demonstrate significant pharmacological potential owing to their diverse bioactive components. *Pleurotus flabellatus* has been shown to exhibit antidiabetic, hepatoprotective and antimicrobial properties (19). It contains compounds that inhibit α-glucosidase, an enzyme involved in carbohydrate digestion, thereby promoting more stable blood glucose levels and offering potential benefits for diabetes management. The vivid pigmentation of *P. djamor* reflects its high antioxidant activity and suggests potential anticancer and cholesterol-lowering properties, attributed to compounds such as lycopene and lovastatin (20). *Pleurotus ostreatus*, rich in pleurotin, β-glucans and lovastatin, has been reported to exhibit anticancer, antimicrobial, antioxidant and immunomodulatory effects (21). These findings underscore the therapeutic promise of *Pleurotus* species in the management of various health conditions.

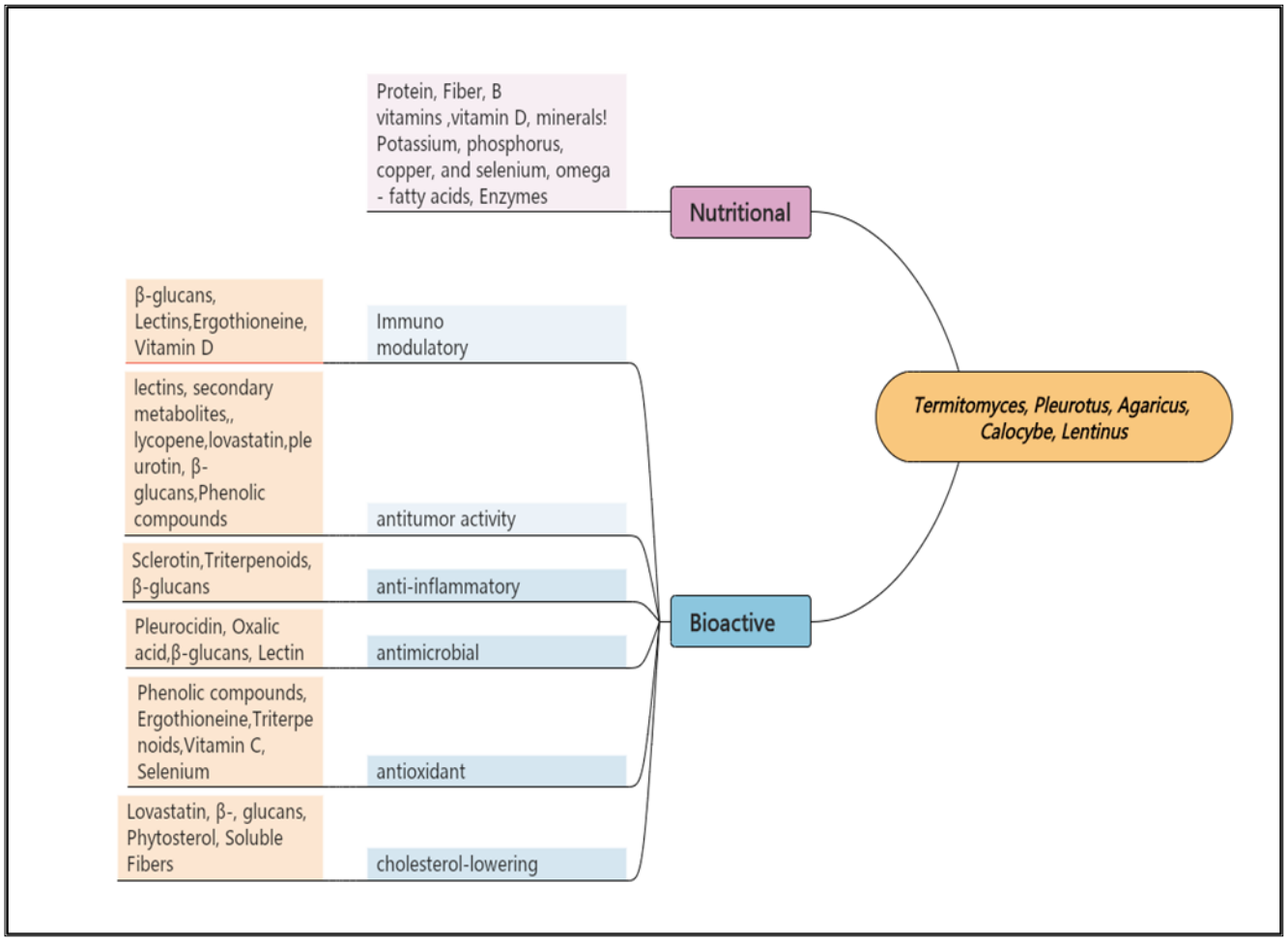

Fig. 5. Mushrooms with potential nutrient and biochemical activity.

Several *Auricularia* species, known for their diverse β-glucans, are currently being investigated for their potential to alleviate inflammation in conditions such as arthritis and inflammatory bowel disease. These polysaccharides may exert their anti-inflammatory effects by modulating immune cell activity and cytokine signalling pathways. Beyond their anti-inflammatory properties, *Auricularia* species exhibit broad-spectrum antimicrobial activity against bacteria, fungi and viruses, attributed to potent bioactive compounds such as pleurocidin and sclerotin. Notably, species like *Auricularia auricula-judae* also contain lovastatin, a compound known for its cholesterol-lowering effects, thereby enhancing their pharmacological relevance. Emerging preclinical evidence suggests that *Auricularia auricula-judae* polysaccharides (AAPs) possess significant anti-obesity potential in murine models. This effect appears to result from a multifaceted mechanism involving the promotion of beneficial gut microbiota, reduction of inflammatory responses and modulation of key signalling pathways (22, 23).

Agaricus campestris is distinguished by its broad medicinal potential. It exhibits anti-proliferative effects on various cancer cell lines, likely due to the presence of β-glucans and phenolic compounds. Furthermore, it demonstrates broad-spectrum antimicrobial activity against bacteria and fungi, mediated by compounds such as pleurocidin and oxalic acid. The immunomodulatory properties of *A. campestris*, driven by its β-glucans, include the activation of immune cells and the potential to mitigate inflammation associated with chronic conditions like arthritis and inflammatory bowel disease (24).

Although limited pharmacological data are available for *Lentinus squarrosulus*, existing research on related *Lentinus* species suggests that it may possess bioactive compounds with health-promoting effects, including immune modulation and antioxidant activity (25).

Calocybe mushrooms are noted for producing calocybin, a potent antimicrobial compound, underscoring their potential applications in medicine and pharmaceuticals. The presence of unique polysaccharides, including β-glucans, supports their role in immune system modulation and gut health (26). Additionally, these mushrooms produce a variety of enzymes with promising applications in food processing and biofuel production (27).

Mushroom-derived β-glucans, characterized by a unique β-1,3-glucan backbone with short β-1,6 branches, function as both immunomodulators and powerful antioxidants. Their distinctive triple-helix structure enhances bioactivity, allowing them to be recognized by specific immune cell receptors. In the context of immunomodulation, they inhibit the expression of pro-inflammatory cytokines such as interleukin-1β and suppress enzymes like cyclooxygenase-2 and nitric oxide synthase. Concurrently, these compounds serve as potent antioxidants, thereby reinforcing their overall health-promoting capabilities (28).

Lectins, the carbohydrate-binding proteins found in mushrooms, exhibit diverse antimicrobial mechanisms, including pore formation, disruption of cell membrane permeability and interaction with bacterial cell wall components. In antifungal activity, lectins display chitin-binding properties that compromise the integrity of fungal cell walls. Beyond their antimicrobial functions, lectins play a crucial role in cellular signalling, immune system modulation, host defense mechanisms and inflammation regulation. Their multifaceted biological activities; particularly their involvement in cancer-related processes-underscore their significance in both physiological and pathological pathways, making them promising targets for drug development and therapeutic interventions (29, 30).

Lovastatin, present in various mushroom species, inhibits the enzyme HMG-CoA reductase, thereby reducing the synthesis of LDL (low-density lipoprotein or "bad cholesterol"). This action promotes the removal of LDL from the bloodstream, effectively lowering overall cholesterol levels (31). The antioxidant activities of phenolic compounds, ergothioneine and triterpenoids are attributed to their capacity to neutralize free radicals. This contributes to enhanced cellular health, reduced inflammation and overall physiological well-being.

Our earlier study on wild mushrooms collected from the Western Ghats highlighted the immunostimulant and adaptogenic properties of specific bioactive compounds such as polysaccharides, fungal immunomodulatory proteins (FIPs) and terpenes-particularly in *Pleurotus ostreatus* and *Termitomyces heimii* (32). These compounds were shown to activate immune effector cells and stimulate the production of cytokines, including IFN-γ and IL-2. Such findings reinforce the potential of wild edible mushrooms as functional foods that support immune health, particularly during viral outbreaks.

Conclusion

The study on wild edible mushrooms among the Mudugar tribe highlights their significant medicinal potential, as evidenced by the Cultural Significance Index. Despite limitations such as a relatively small sample size and potential inter-tribal variability, this research makes a valuable contribution to understanding the complex relationship between the Mudugar community and their fungal resources. It establishes a foundation for future investigations and biocultural conservation efforts, fostering the integration of traditional ecological knowledge with contemporary scientific paradigms. The Mudugars' deep-rooted connection with wild mushrooms; encompassing cultural, ecological and medicinal dimensions; underscores their potential contribution to public health across diverse populations. Continued research into specific bioactive compounds and their therapeutic applications may further illuminate the scope of the Mudugar tribes' traditional knowledge and the broader implications of wild mushrooms in promoting human health.

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Authors' contributions

SNK carried out the ethnomycological survey, data analysis and manuscript writing. MK supervised the research, guided study design and critically reviewed the manuscript. Both authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

References

1. Wendiro D, Wacoo AP, Wise G. Identifying indigenous practices for cultivation of wild saprophytic mushrooms: Responding to the need for sustainable utilization of natural resources. J Ethnobiol Ethnomed. 2019;15:1–5.https://doi.org/10.1186/s13002-019-0342-z
2. Anderson MK, Lake FK. California Indian ethnomycology and associated forest management. J Ethnobiol. 2013;33(1):33–85. https://doi.org/10.2993/0278-0771-33.1.33
3. Feinberg B. Undiscovering the pueblo mágico: Lessons from Huautla for the psychedelic renaissance. In: Plant Medicines, Healing and Psychedelic Science: Cultural Perspectives. 2018. p. 37–54. https://doi.org/10.1007/978-3-319-76720-8_3
4. Dounias E. The management of wild yam tubers by the Baka Pygmies in Southern Cameroon. Afr Stud Monogr Suppl. 2001;26:135–56.
5. Xu Z, Chen X, Zhong Z, Chen L, Wang Y. *Ganoderma lucidum* polysaccharides: Immunomodulation and potential anti-tumor activities. Am J Chin Med. 2011;39(1):15–27. https://doi.org/10.1142/S0192415X11008610
6. Sohret Oglu D, Huang S. Ganoderma lucidum polysaccharides as an anti-cancer agent. Anti-Cancer Agents Med Chem. 2018;18 (5):667–74. https://doi.org/10.2174/1871520617666171113121246
7. Bernard HR. Research methods in anthropology: Qualitative and quantitative approaches. 6th ed. Lanham: Rowman & Littlefield; 2017.
8. Turner NJ. The importance of local knowledge in climate change adaptation. Local Environ. 2014;19(4):427–49.
9. Silva JDA, Nascimento MGP, Grazina LG, Castro KDC, Mayo SJ, Andrade IM. Ethnobotanical survey of medicinal plants used by the community of Sobradinho, Luís Correia, Piauí, Brazil. J Med Plants Res. 2015. https://doi.org/10.5897/JMPR2015.5881
10. Shahina NK. Ethnomedicinal and ecological studies of wild edible mushrooms used by selected tribes in Palakkad and Wayanad districts of Kerala [PhD thesis]. 2019. [cited 1 May 2019]. Available from: https://hdl.handle.net/10603/273416
11. Bastos C, Liberal Â, Moldão M, Catarino L, Barros L. Ethnomycological prospect of wild edible and medicinal mushrooms from Central and Southern Africa-A review. Food Front. 2023. https://doi.org/10.1002/fft2.215
12. Rahmad N, Al-Obaidi JR, Rashid NMN, Zean NB, Yusoff MHYM, Shaharuddin NS, et al. Comparative proteomic analysis of different developmental stages of the edible mushroom Termitomyces heimii. Biol Res. 2014;47(1):1–8. https://doi.org/10.1186/0717-6287-47-30
13. Bhattacharya D, Singh K, Sarma TS. Nutritional composition of wild mushroom species of Darjeeling hills, India. Int J Curr Microbiol App Sci. 2017;6(8):557–64.
14. Kadnikova IA, Costa R, Kalenik TK, Guruleva ON, Yanguo S. Chemical composition and nutritional value of the mushroom *Auricularia auricula-judae*. J Food Nutr Res. 2015;3(8):478–82
15. Chang ST. The world mushroom markets: China, Japan and Korea. Boca Raton: CRC Press; 2011.
16. Kalač P. A review of chemical composition and nutritional value of wild-growing and cultivated mushrooms. J Sci Food Agric. 2013;93(2):209–18. https://doi.org/10.1002/jsfa.5960
17. Atungiibo AO, et al. *Termitomyces clypeatus,* a wild edible mushroom from termite mounds in southwestern Nigeria: Nutritional composition, antioxidant properties and *in vitro* antiproliferative activity. J Sci Food Agric. 2017;97(10):3491–99. https://doi.org/10.1007/s00253-018-8991-8
18. Badalyan SM, Barkhudaryan A, Rapior S. Recent progress in research on the pharmacological potential of mushrooms and prospects for their clinical application. In: Medicinal mushrooms: recent progress in research and development. 2019. p. 1–70. https://doi.org/10.1007/978-981-13-6382-5_1
19. Chaurasia PK, Bharati SL, Kumar S. Recent studies on biotechnological roles of *Pleurotus* spp. J Biotechnol Bioprocess. 2020;1(3):2766–314. https://doi.org/10.31579/2766-2314/018
20. Acharya K, Khatua S, Ray S. Quality assessment and antioxidant study of *Pleurotus djamor* (Rumph. ex Fr.) Boedijn. J Appl Pharm Sci. 2017;7(6):105–10. https://doi.org/10.7324/JAPS.2017.70614
21. Venturini ME, Silva SMR, Baptista MA, et al. *Pleurotus ostreatus*: A promising source of bioactive molecules for use in medicine. Int J Mol Sci. 2020;21(2):642. https://doi.org/10.3390/ijms21020642
22. Liu N, Chen X, Song J, Chen M, Gong P, Jia W, et al. Hypoglycemic effects of *Auricularia auricula* polysaccharides on high-fat diet and streptozotocin-induced diabetic mice using metabolomics analysis. Food Funct. 2021;12(20):9994–10007. https://doi.org/10.1039/D1FO02022F
23. Zhou Y, Jia Y, Xu N, Tang L, Chang Y. *Auricularia auricula-judae* (Bull.) polysaccharides improve obesity in mice by regulating gut microbiota and TLR4/JNK signalling pathway. Int J Biol Macromol. 2023;250:126172. https://doi.org/10.1016/j.ijbiomac.2023.126172
24. Wasser SP. Medicinal mushroom science: history, current status, future trends and unsolved problems. Int J Med Mushrooms. 2010;12(1):1–16. https://doi.org/10.1615/IntJMedMushr.v12.i1.10
25. Lau BF, Abdulla N. Bioprospecting of *Lentinus squarrosulus* Mont., an underutilized wild edible mushroom, as a potential source of functional ingredients: a review. Trends Food Sci Technol. 2017;61:116–31. https://doi.org/10.1016/j.tifs.2016.11.017
26. Nataraj A, Govindan S, Ramani P, Subbaiah KA, Sathianarayanan S, Venkadasamy B, et al. Antioxidant, anti-tumour and anticoagulant activities of polysaccharide from *Calocybe indica* (apk2). Antioxidants. 2022;11(9):1694. https://doi.org/10.3390/antiox11091694
27. Devi R, Thakur R, Kapoor S, Joshi SJ, Kumar A. Comparative assessment on lignocellulose degrading enzymes and bioethanol production from spent mushroom substrate of *Calocybe indica* and *Volvariella volvacea*. Environ Sci Pollut Res. 2023:1–15. https://doi.org/10.1007/s11356-023-26988-1
28. Mirończuk-Chodakowska I, Kujawowicz K, Witkowska AM. Beta-glucans from fungi: Biological and health-promoting potential in the COVID-19 pandemic era. Nutrients. 2021;13(11):3960. https://doi.org/10.3390/nu13113960
29. Singh SS, Wang H, Chan YS, Pan W, Dan X, Yin CM, et al. Lectins from edible mushrooms. Molecules. 2014;20(1):446–69. https://doi.org/10.3390/molecules20010446
30. Sarup Singh R, Preet Kaur H, Rakesh Kanwar J. Mushroom lectins as promising anticancer substances. Curr Protein Pept Sci. 2016;17 (8):797–807. https://doi.org/10.2174/1389203717666160226144741
31. Pandey VV, Varshney VK, Pandey A. Lovastatin: A journey from ascomycetes to basidiomycetes fungi. J Biol Act Prod Nat. 2019;9

(3):162–78. https://doi.org/10.1080/22311866.2019.162245

32. Shahina NK, Madhusudhanan K, Angel Mathew. Immune-stimulants and adaptogenic properties of selected wild edible mushrooms collected from the Western Ghats, India. Int J Pharm Sci Drug Res. 2022;14(5):639–44. https://doi.org/10.25004/IJPSDR.2022.140519

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