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Evaluation of wild edible mushrooms in Vansda National Park, Gujarat, India

Jigitsa Patel*, Dilipkumar Patel, Dhruv Patel

Biology Department, B.K.M Science College (affiliated to Veer Narmad South Gujarat University, Surat), Valsad-396001, Gujarat, India

ABSTRACT

The Vansda National Park is situated in Navsari in South Gujarat on the northern-most limit of the Western Ghats. This park is famous for the biodiversity of flora and fauna. The area is also quite rich in mushrooms, many of which are traditionally used by local communities for food and medicine due to their palatability, nutritional, and nutraceutical attributes. The area under investigation was unexplored, as far as mushroom biodiversity is concerned because for which this study was undertaken. The study aimed to gather information about the wild edible mushrooms growing in Vansda National Park with a view to familiarizing about their ethnic uses, including their respective local names and cooking methods. During the survey, as many as 100 respondents were consulted who revealed the edibility of 21 mushroom species by the locals by preparing various preparations, including soup, and other dishes.

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***Corresponding author:**
Jigitsa Patel
E-mail: jigitsa999@gmail.com

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INTRODUCTION

Mushrooms represent one of the world's greatest untapped resources of nutritious food. Mushrooms are edible vegetables a fleshy spore-bearing fungi belonging to *Basidiomycota* and *Ascomycota* (Tasneem & Achar, 2022). Mushrooms have been consumed as a nutritional diet and medicine from the earliest time. These macrofungi are identified as nutritional foods throughout the world since they contain vitamins, minerals, proteins, chitin, essential-amino acids, and low fat and calories makes their nutritional value comparable to corn and soybean (Valverde *et al.*, 2015).

Mushrooms produce a variety of bioactive compounds that are known to have potential source of antioxidant and antimicrobial properties (Gebreyohannes *et al.*, 2019). *Ganoderma* spp. has been reported to have pharmacological effects (Deepalakshmi & Mirunalini, 2011). It has an antioxidant property, stimulates the immune system, and likewise has an ability to reduce heart disease and cancer (Russell & Paterson, 2006). Various biologically active polysaccharides from the fruiting bodies of *G. lucidium* have been isolated (Bhat *et al.*, 2021). Schizophyllan obtained from split- gill fungus, *Schizophyllum commune*, is produced for cancer and bioactive cosmetic ingredients (Ferreira *et al.*, 2010). *Polyporus umbellatus* and *Polyporus alveolaris*, containing different types of polypeptides and cytotoxic steroids were found to possess immuno-stimulating, anti-cancer, anti-inflammatory, hepatoprotective, anti-fungal, and anti-bacterial effects (Zheng *et al.*, 2011). Oyster mushrooms (*Pleurotus* species) have hypocholesterolaemia, antioxidant, anti-bacterial, anti-diabetic, hepatoprotective, anti-carcinogenic, anti-viral, anti-arthritic, and immune-modulatory properties (Kumar, 2020). Baker *et al.* (2008) reported anti-tumour, immune-modulating, and anti-metastasis properties in *Phellinus linteus*. Patel and Goyal (2012) reported that the mushrooms possessing anti-carcinogenic characteristics are from genus *Pleurotus*, *Phellinus*, *Agaricus*, *Clitocybe*, *Ganoderma*, *Trametes*, *Antrodia*, *Xerocomus*, *Cordyceps*, *Schizophyllum*, *Calvatia*, *Flammulina*, *Inonotus*, *Suillus*, *Albatrellus*, *Inocybe*, *Funlia*, *Russula*, *Lactarius*, and *Fomes*. Compounds present in mushrooms having anti-cancer characteristics which play an important role as reactive oxygen species inducer, anti-mitotic, a mitotic kinase inhibitor, topoisomerase inhibitor, and inhibition of angiogenesis causing apoptosis of cancer cells, ultimately preventing cancer proliferation. Manjula *et al.* (2024) observed *T. microcarpus* mushrooms have antioxidation, anti-inflammation, and antitumor properties. They can potentially be developed into health care products as dietary supplements. Gupta *et al.* (2024) investigated *Russula rosea* plays a vital role in providing nutrition and has potential pharmacological advantages.

The National Park area provides an ideal environment for mushroom growth due to its tropical moist deciduous forests, which provide the perfect temperature and a large amount of

forest debris to support the nutritional needs of mushrooms. However, despite their biological potential, mushrooms are considered a high-end commodity in the market due to their high price, which could generate work opportunities and livelihoods for local communities (Bellere *et al.*, 2023). Unfortunately, this potential remains largely untapped in the area due to limited technological resources and a lack of experts in the field of mycological science, leaving this valuable resource overlooked in the surrounding wilderness.

MATERIALS AND METHODS

Study Area

Out of the total 16,902 km^2 area declared as a protected area of the state, Vansda National Park (VNP) is the smallest National Park, comprising 23.99 km^2.Vansda National Park (20°51'16" - 21°21'22" N and 73°20'30" - 73°31'20" E) is in Vansda Taluka of Valsad District, now in Navsari District in the Southern region of Gujarat state. The eastern boundary is formed by the continuation of Dang Forest and Ambica River and the western side is marked by Navtad–Kalaamba road. The northern boundary is formed of the Waghai–Bilimora railway line and Ambica River the southern margin is marked by the reserve forest of Vansda Taluka (Patel, 2003).

These study areas in the province of Government of Gujarat Forest Department served as the sampling site in data gathering these are in the study site are in Kilad - 20.7542° N, 73.4874° E, Sadad devi - 20.7855° N, 73,4710° E, Navtad - 20.7494° N, 73.4268° E, Tadpada - 20.7517° N, 73.4504° E, Kharjai - 20.8020° N, 73.4375° E, Kala Amba - 20.7927° N, 73,4563° E. A total of 100 respondents of randomly selected individuals from Killad, Sadad Devi, Navtad, Tadpada, Kharjai, Kala amba were interviewed regarding the edible mushroom available and being served as food in their locality (Figures 1 & 2).

Collection and Identification of Mushrooms

Systematic surveys were conducted across various locations in the Vansda National Park, with the primary focus on documenting the fungal species present. Detailed field records were maintained, specifically noting the habitats, host organisms, and substrates of the fungi. Photographs of the collection sites, GPS location, and the fruiting bodies were taken to support further study and identification. Macroscopic features were carefully analysed from freshly collected specimens, while microscopic characteristics were observed from dried materials. Some of the mushroom specimens were preserved in 4% formaldehyde solution. These microstructures were examined using a microscope. Further identification was conducted by cross-referencing the collected data with standard literature, monographs, and specialized books on mycology. Online databases such as www.mycokey.com and Fungi ID @ MycoAsia. Finally, all the collected specimens were deposited in the Department of Biology, BKM Science College, Valsad, Gujarat, India, ensuring proper curation for future research and reference.

Ethnomycological Data Collection

The ethnomycological study was conducted from June 2021 to December 2023. Data were gathered from local informants through interviews. Each informant was interviewed at least two times to obtain comprehensive information on various aspects, including the historical context, edibility, traditional uses, preservation methods and commercial significance. Interviews and discussions were held in the local people to ensure accurate communication. Verification of macrofungal species was carried out during the rainy season, with informants accompanying the research team on field visits to confirm species identification and the associated information. This was done using both the specimens collected in the field and photographs previously taken for reference.

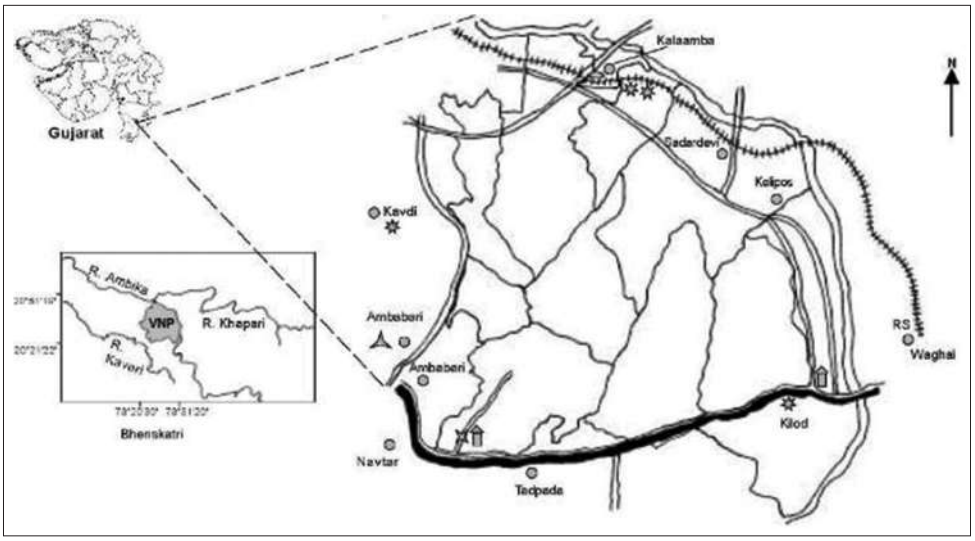

Figure 1: Map of Gujarat showing Vansda National Park

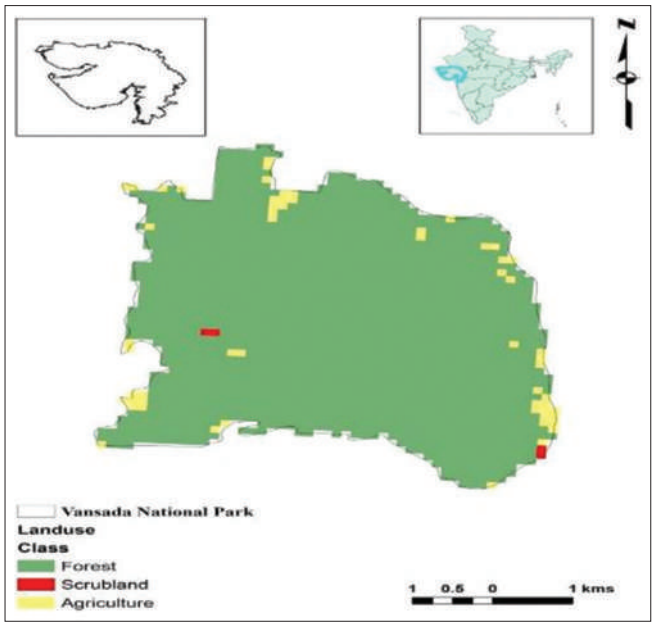

Figure 2: Map of Vansda National Park

RESULTS AND DISCUSSION

Assessment of wild edible mushrooms was done by conducting an interview with the individuals residing within the premises of Vansda National Park to determine the different indigenous edible mushrooms consumed by the locals. Results showed that there are total 21 mushroom species belonging to 7 families were known to be edible and consumed by the Tribal communities (Kokna, Gamite, Dhodiya, Nayka, Warli, Chaudhri) and are *Termitomyces microcarpus*, *T. heimii*, *T. clypeatus*, *T. umkowaan*, *T. fuliginosus*, *T. tylerianus*, *T. le-testui*, *Agaricus campestris*, *A. augustus*, *A. subrufescens*, *Calvatia craniiformis*, *Lepista nuda*, *Coprinus comatus*, *Macrocybe gigantean*, *Russula rosea*, *Pleurotus ostreatus*, *P. albinus*, *P. dryinus*, *P. cornucopiae*, *Pluteus cervinus* and *Phlebopus marginatus* (Table 1 & Figure 3).

The diversity of wild macrofungi is heavily influenced by the specific environmental conditions of their habitat. The harvesting of these fungi relies on ethnomycological knowledge passed down through generations. The local community primarily gathers wild macrofungi for personal consumption and to earn a livelihood by selling them in local markets. Gatherers possess a deep understanding of the morphological characteristics of edible fungi and can easily distinguish them from poisonous varieties. Aryal and Budathoki (2013) observed that Termitomyces was the largest genus. The dominance of *Termitomyces* spp. is in accordance with most of the studies conducted in the tropical regions due to their flavour, taste, and nutritional values.

Wild macro-fungi are primarily harvested by residents near forest patches, who then sell them in local markets. The consumption of these fungi varies across regions, with extensive local knowledge helping to reduce the incidence of mushroom poisoning. Reports of accidental consumption of poisonous mushrooms are rare, typically occurring only 3–4 times annually. Those who do consume poisonous mushrooms often experience symptoms such as nausea, vomiting, diarrhea, and jaundice. However, no casualties have been reported in recent years, indicating that the community has a strong understanding of how to distinguish between edible and toxic wild macro-fungi.

People from ethnic tribal communities have a deep connection with and extensive understanding of forest resources (Das *et al.*, 2014). In particular, the Trible people are known for their ability to collect wild macro fungi, possessing a rich ethnomycological knowledge that enables them to easily distinguish between edible and poisonous mushrooms. The infrequent cases of mushroom poisoning among the peoples highlight the accuracy of their mycological expertise in identifying safe fungi. Although they do not use a standardized method, their identification process primarily relies on visual examination and smelling the fruiting body. This knowledge not only allows the Trible to gather mushrooms as a delicious food source but also serves as an important means of economic subsistence. Documenting this traditional knowledge could play a significant role in both identifying edible mushrooms and preventing instances of mushroom poisoning in the future.

Based on the survey conducted among randomly selected residents from the Kilad, Sadad Devi, Navtad, Tadpada, Kharjai, and Kala Amba patches of Vansda National Park. The survey showed that the most commonly consumed wild mushrooms in the locality are *Termitomyces microcarpus* (96%), *Termitomyces heimii* (82%), *Russula rosea* (76%), *Pleurotus ostreatus* (68%), *Pluteus cervinus* (60%), and *Pleurotus cornucopiae* (56%). Some species were less frequently consumed *Agaricus subrufescens* (15%), *Agaricus augustus* (26%), *Agaricus campestris* (20%), *Pleurotus dryinus* (28%), *Macrocybe gigantean* (10%), Other Species Consumed to a Moderate *Termitomyces clypeatus* (48%), *Calvatia craniiformis* (45%),*Termitomyces umkowaan* (37%), *Pleurotus albinus* (62%), *Lepista nuda* (30%),*Coprinus comatus* (35%), *Termitomyces fuliginosus* (42%), *Termitomyces le-testui* (35%), *Termitomyces tylerianus* (45%), *Phlebopus marginatus* (32%). Consumption Trends according to (Figure 4). Figure 5 highlights these consumption trends, illustrating that *Termitomyces microcarpus*, *Termitomyces heimii* and *Russula rosea* were the commonly preferred species among the community, while *Agaricus subrufescens*, *Agaricus augustus*, *Agaricus campestris*, and *Macrocybe gigantea* were consumed rare often. Figure 6 below shows the distribution of edible mushrooms by family in the park Lyophyllaceae-33%, Agaricaceae-24%, Pleurotaceae-19%, Tricholomataceae-9%, Other families (Boletinellaceae, Russulaceae, Pluteaceae)-5% each.

Twelve edible species of macrofungi were identified from two collection sites of Bicol Natural Park which belong to the genera *Auricularia*, *Neolentinus*, *Lentinus*, *Polyporus*, *Aleuria*, *Cookeina*, *Sarcoscypha*, *Schizophyllum*, and *Lyophyllum* (Bellere *et al.*, 2023). Sharma *et al.* (2022a) found a total of fourteen species of wild edible mushrooms belonging to six families and ten genera are used by the inhabitants of Jammu. Out of these species, eleven (78.6%) were new records for Jammu and Kashmir *Agaricaceae*, with 5 genus and 5 species, and *Lyophyllaceae* with

Table 1: List of edible macro mushrooms of Vansda National Park

S. No	Scientific name	Family	Common name	Local name
1	*Agaricus augustus*	*Agaricaceae*	The prince	Unknown
2	*Agricus campestris*	*Agaricaceae*	Field Mushroom	Unknown
3	*Agricus subrufescens*	*Agaricaceae*	Almond Mushroom	Unknown
4	*Calvatia craniiformis*	*Agaricaceae*	Brain Puffball	Bharkhuda
5.	*Coprinus comatus*	*Agaricaceae*	Shaggy Mane	Unknown
6.	*Lepista nuda*	*Tricholomataceae*	Wood Blewit	Unknown
7	*Macrocybe gigantea*	*Tricholomataceae*	Giant Mushroom	Unknown
8	*Russula rosea*	*Russulaceae*	Rosy Brittlegill	Bhoifuliyu
9	*Pluteus cervinus*	*Pluteaceae*	Deer Shield	Unknown
10	*Pleurotus albidus*	*Pleurotaceae*	Oyster Mushroom	Unknown
11	*Pleurotus dryinus*	*Pleurotaceae*	Veiled oyster	Unknown
12	*Pleurotus cornucopiae*	*Pleurotaceae*	Branched oyster mushroom	Vasaldi
13	*Pleurotus ostreatus*	*Pleurotaceae*	Pearl oyster Mushroom	Unknown
14	*Termitomyces clypeatus*	*Lyophyllaceae*	Black Mousedeer	Mithi Mushroom
15	*Termitomyces fuliginosus*	*Lyophyllaceae*	Termite Mushroom	Unknown
16	*Termitomyces heimii*	*Lyophyllaceae*	Termite Mound	Alimbi
17	*Termitomyces le-testui*	*Lyophyllaceae*	Termite Mushroom	Aadim
18	*Termitomyces microcarpus*	*Lyophyllaceae*	Termite Mushroom	Sita Aadim
19	*Termitomyces tylerianus*	*Lyophyllaceae*	Termite Mushroom	Unknown
20	*Termitomyces umkowaan*	*Lyophyllaceae*	Termite Mushroom	Chikne
21	*Phlebopus marginatus*	*Boletinellaceae*	Salmon gum mushroom	Unknown

1 genus and 5 species were the most represented families *and Termitomyces* was the largest genera with five species (45.5%). Rout *et al.* (2020) reported 60 species of wild mushrooms belonging to 33 genus and 25 families from Dhenkanal, Odisha, India. Among those, only 10 species are edible and consumed by local communities, and the rest are poisonous or bitter. Kumar *et al.* (2022) documented 10 wild edible mushrooms collected from the forest by the tribal communities which are used to sell in weekly markets and road sides of Mayurbhanj, Odisha, India. 27 species identified, 15 are edible, 4 inedible, 4 poisonous and 4 species possess medicinal value. Some of the edible species such as *S. bovista*, *T. clypeatus* and *T. eurhizeus* are also used for medicinal purposes. Mushtaq *et al.* (2023) were documented eleven species of mushrooms, belonging to 11 genera and 10 families in survey. *Helvella crispa*, *Geopora arenicola*, and *Morchella esculenta* are the only species in the collection that are members of the phylum *Ascomycota*. Karun and Sridhar (2017) presented ethnic knowledge of 51edible wild mushrooms belong to 23 genera. Among the 51 wild mushrooms irrespective of the extent of availability, the most preferred include *Astraeus hygrometricus*, *Clitocybe infundibuliformis*, *Fistulina hepatica*, *Lentinus sajor-caju*, *Pleurotus* (5 spp.) and *Scleroderma citrinum* and *Termitomyces* (18 spp.) in the Western Ghats region of India.

26 different species of macrofungi belonging to 14 genera and 13 families were identified (Sarma *et al.*, 2010). Except for *Morchella esculanta* rest of the species belong to *Basidiomycetes*. Out of the 26 species identified 3 belongs to family *Auriculariaceae*, 3 belongs to *Agaricaceae*, 2 belongs to *Boletaceae*, 2 belongs to *Lycoperdaceae*, 2 belongs to *Cantherallaceae*, 1 belongs to *Ganodermataceae*, 4 belongs to *Marasmiaceae*, 2 belongs to *Polyporaceae*, 1 belongs to *Schizophyllaceae*, 5 belongs to *Tricholomataceae* (all *Basidiomycetes*) whereas, 1 belongs to *Helvellaceae* (i.e., *Ascomycetes*) in Assam. Malik *et al.* (2017) documented the ethnomycological use of 33 species of medicinal and edible mushrooms belonging to 23 genera and 17 families. It was revealed from this study that mushrooms *Bovista plumbea*, *Coprinus comatus*, *Disciotis venosa*, *Lentinus tigrinus*, *Helvella crispa*, and *Geopora sumneriana* were used as ethnomedicines against chest ailments and against cold in the surveyed areas by local herbalists of Jammu and Kashmir. Khaund and Joshi (2013) were documented by the Khasi tribes, 11 different edible macrofungal species belonging to 9 genera and 8 different families of Meghalaya. Singha *et al.* (2020) were identified 23 different mushroom species belonging to 16 families from the tribal areas of Gurguripal. Among them, 12 mushroom species were found to be edible and 19 were reported to be ethnomedicinally important.

This survey provides valuable insights into the patterns of edible macrofungi consumption in the region. The results gathered from Kilad, Sadad Devi, Navtad, Tapada, Kharjai, and Kala Amba patches have revealed the presence of numerous edible mushroom species that have yet to be identified and recognized for consumption and domestication. Additionally, it was noted that the residents of Vansda National Park require technical, research-based technologies to support the domestication of the naturally occurring edible mushrooms in their region.

Vansda National Park is home to a diverse range of macrofungi, some of which are consumed by local tribals. The following are some of the commonly consumed species and their local names *T. microcarpus* - "Sita Aadim", *T. umkowaan* - "Chikne", *T. heimii* - "Alimbi", *T. letestui* - "Aadim", *T. clypeatus* - "Mithi Mushroom", *R. rosea* - "Bhoifuliyu", *P. cornucopiae* - "Vasaldi", *B. craniiformis* - "Bharkhuda". Other species have no known local terminology. Mushrooms like 'Dhingri' (*Pleurotus* sp.), 'Kanger' (*Cantharellus cibarius*), 'Maazkhel' (*Macrolepiota procera*), 'Kundi' (*Geopora* spp.), and 'Guchchi' (*Morchella spp.*) were highly sought after for their distinct flavours and nutritional value (Kumar & Sharma, 2011; Lalotra *et al.*, 2018;

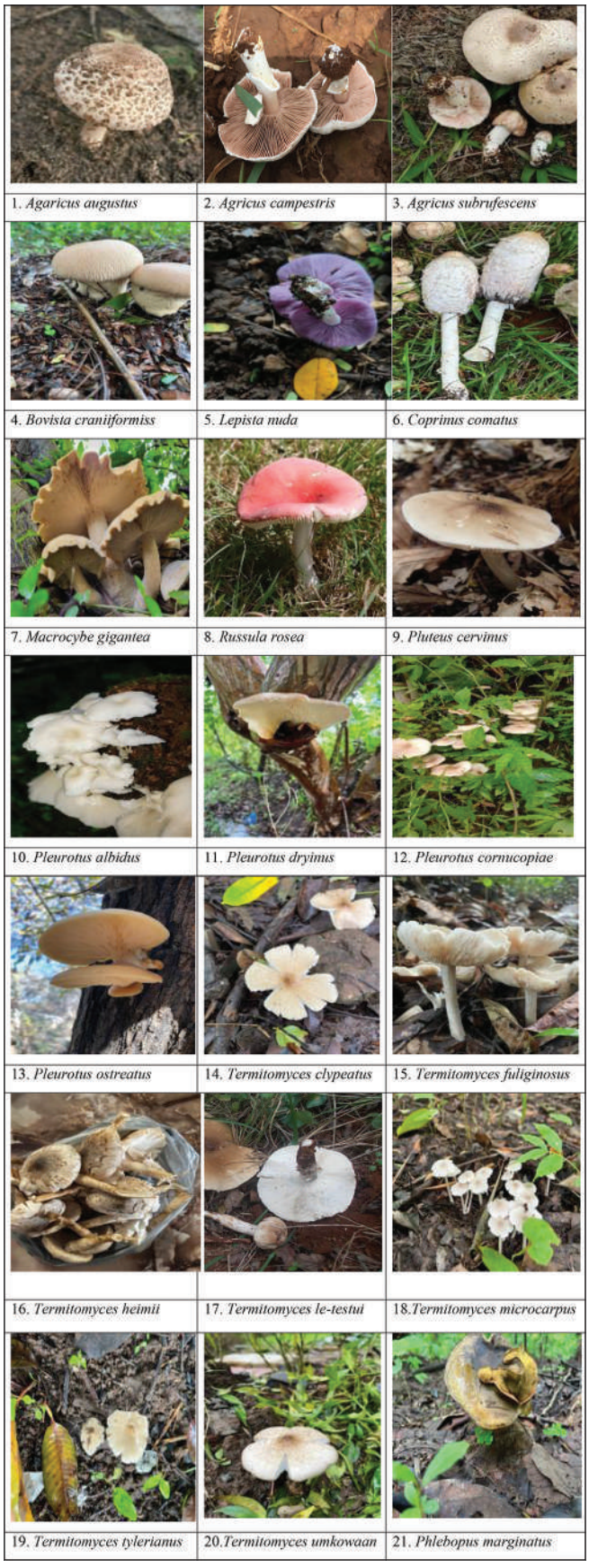

Figure 3: Sporocarps of wild edible macrofungi with their habitat in Vansda National Park

Sharma *et al.*, 2022b). Basumatary and Gogoi (2016) observed people of the Bodo community know mushrooms common names like *Lentinus polychrous* (Salni mwikhun) *Volvariella volvacea* (Jigabni mwikhun) *Agaricus semotus* (Mwikhun Ghai) *Stropharia semiglobata* (Mwikhun Jujai) *Termitomyces eurrhizus* (Mwikhun Hapaw). Sharma *et al.*, (2022b) were studied some local names that were used for a group of fungi, e.g., agarics were commonly known as 'Chatri', puffballs as 'Khucoon', and earthstars as 'Zameeni Tare'. Among agarics, Termitomyces species were particularly known as 'Khumb', 'Tanna', 'Sootree', or 'Naadu'.

Several traditional practices using mushrooms are reported to be undertaken by the Trible community in Vansda National Park. *Calvatia craniiformis* powder was used for wound infection. *Coprinus comatus* use for skin infections. Species like *Termitomyces hemii*, *T. fuliginosus*, *T. microcarpus* and *Pleurotus cornucopiae* is used for immunity booster. One myth regarding for the consumptions the Trible's people thinks they do not consume mushroom once in a year they believe that then immune system does not defence against the viral disease. Lahiri *et al.* (2010) investigated spore mass of *Bovista* spp. is applied on the skin for the treatment of bruised skin infections. Aryal and Budhathoki (2013) reported dried powder of Coprinus comatus is given to children with rice or milk to induce good sleep, while *Termitomyces clypeatus* and *T. eurrhizus* are being used as medicine against fever and measles. A mixture of *T. eurrhizus* with other herbs is reported to be used as a lotion against skin problems. Dutta and Acharya (2014) discovered some mushrooms like *Daldinia concentrica* and *Pisolithus arhizus* are reported to be mixed with coconut oil for use against skin ailments like itching, burning, and minor skin infections. *Schizophyllum commune* is reported to be used as a tonic in the form of soup made in with water. *Termitomyces clypeatus* is another mushroom that is being used in the form of paste for the treatment of pox. Mridu and Atri (2015) observed *P. pistillaris* is also used as a medicine. Its fresh sporocarp is mashed as a paste with mustard oil and applied on the wounds for treatment. The blackish powder of mature fruit bodies is also used for this purpose.

The tribal people use wild macro fungi to prepare a variety of delicious dishes, especially during the rainy season when mushrooms are abundant. They gather these mushrooms from the fields and incorporate them into meals, often as a supplement to lunch and dinner. With a long tradition of cooking with wild fungi, the tribes have developed unique recipes passed down through generations, using different local ingredients and spices.

Mushroom soup

The mushrooms are thoroughly washed and cut into small pieces and water is removed by applying pressure. The mushroom is then fried with oil and salt, and green chilli and a little garlic paste are added to it. When it is half cooked, hot water is added and boiled for a few minutes till the mixture becomes thick. They were also added rice flour or maida for thickness. Sometimes coriander is also added to the soup.

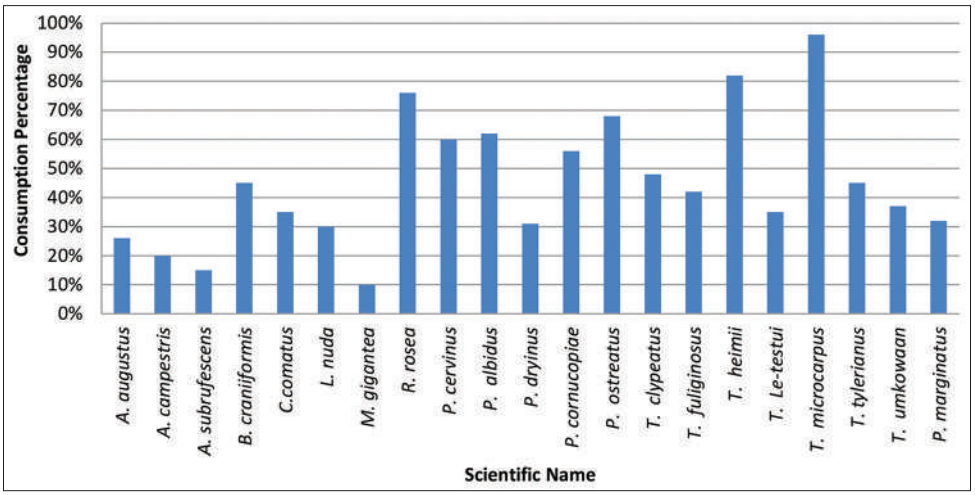

Figure 4: Distribution of wild edible mushroom species consumption by tribal people in percentage

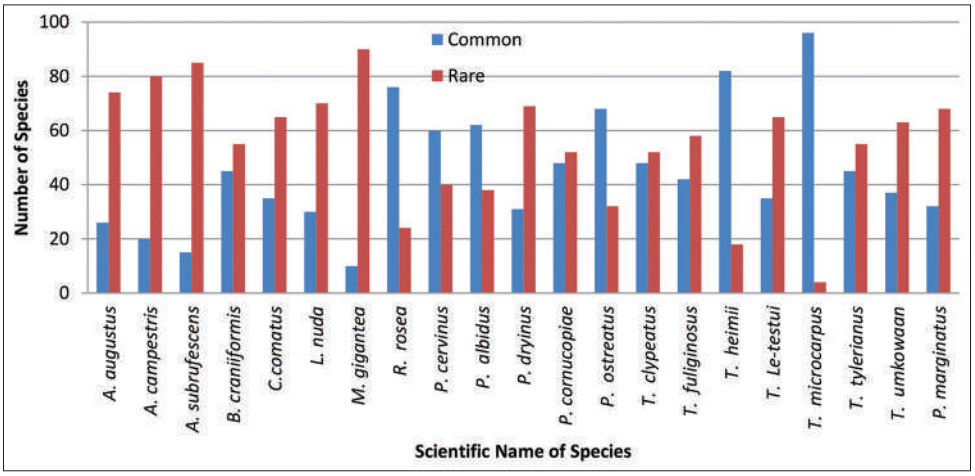

Figure 5: Distribution of wild edible mushroom species commonly and rarely consumption by tribal people

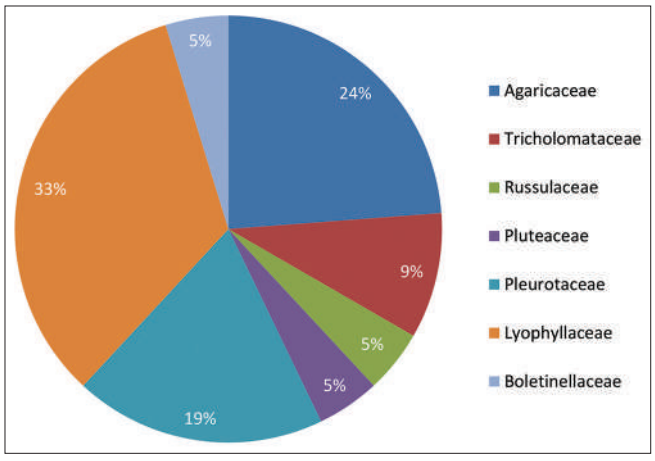

Figure 6: Percentage of Distribution of Macrofungi in Different Family

Mushroom fry

The mushrooms were collected and washed thoroughly with water and then sliced off and then kept in water to reduce the level of contamination. First, the oil is heated in a pan and then the finely chopped onion and the chilli are poured and stirred for 1-2 mins. After that, sliced mushroom is poured and stirred frequently until the mushrooms starts to release their moisture. When all the moisture content is removed a little amount of water is added and allowed to boil. There after ingredients like salt, garlic paste, jeera powder, chilli powder, and turmeric powder are added at different concentrations to make its texture attractive and boiled for a few minutes until it's dry.

Mushroom curry

First, heat oil in a pan and sauté mustard seeds, cumin seeds, and chopped onions until golden brown. Add ginger-garlic paste and cook until fragrant. Stare in turmeric, red chili, coriander powder, and salt. Add pureed tomatoes pure or tamarind paste, cooking until the oil separates. Add sliced mushrooms, coat them with the sauce, and cook for 5-7 minutes until tender. Pour in water for the desired curry consistency and simmer for 5 minutes. Finish with garam masala, garnish with fresh coriander, and serve with rice or roti.

Although many wild varieties of macro fungi grow in the forest patches of the region during the rainy season, it has been learnt that only 5 species are extensively used for consumption and in the market. The most commonly preferred macro fungi are *Termitomyces hemii*, *Termitomyces microcarpus*, *Termitomyces fuliginosus*, *Pleurotus ostreatus*, and *Pleurotus cornucopiae*, which are commonly found to grow in the wild during the months of June to December. The average market prices of the wild edible mushroom species ranged from Rs. 150-200/kg with *A. campestris*, Rs. 250-300/kg *T. fuliginosus*, Rs. 220-350/kg *T. microcarpus*, Rs. 500-650/kg *P. cornucopiae* and *T. hemii* being the costliest variety sold at the price Rs.1000-1200/kg throughout the selling period. It was being sold in all the local markets and was available in fresh form only in rainy season. Khaund and Joshi (2013) noted Khasi tribe sold mushroom 200-350/kg with *Clavulina spp.* being the costliest variety sold at the price of Rs 300-350/kg. Some other of edible species that are reported to be traded by them are *Gomphus floccosus* Rs.200/kg, *Tricholoma viridiolivaceum* Rs. 200/kg, *T. saponaceum* Rs. 200/kg, *Craterellus odoratus* Rs.280/kg, *Lactarius volemus*, *Cantharellus cibarius* Rs.280/kg, *Laccaria lateritia* Rs. 280-300/kg, *Albatrellus sp.* Rs. 200/kg, *Ramaria sp.* Rs. 250-300/kg and *Clavulina sp.* Rs. 300-350/kg. Species like *T. heimii* and *T. mammiformis* are sold by the vegetable vendors in the local markets of Punjab at the rate of Rs. 50 to 60 per kg (Atri *et al.*, 2005). Dutta and Acharya (2014) noted Mushrooms species are being sold in the local markets at varying prices like Termitomyces heimii @ Rs. 200 per kg, Auricularia auricula @ Rs. 1200 per kg.

The water content of the substrate and the relative humidity of the atmosphere play a crucial role in regulating fungal growth and reproduction. A relative humidity of 70% is likely the minimum threshold for initiating fruiting body formation, while 80% humidity is required for further development. Humidity levels exceeding 90% can higher the fruiting of mushroom species. Temperature also significantly impacts fungal growth and reproduction, with temperatures between 25-35 °C being ideal for fruit body formation in many mushroom species (Chandrawati *et al.*, 2014). In the present survey the month of July, August and September showed the highest levels of macrofungi fructification in Vansda National Park.

However, in the present investigation July and August month of each year (2021-23) showed a greater number of macrofungal species. There was a complete absence of fungal species in Jan to May during each year. Moderate numbers of species were recorded during October and June of each year. Lesser number of species was noticed November and December (Table 2). Varying number of macrofungi of different species in different month may be due to low relative humidity, low temperature range, very little or no rainfall.

As evident from Table 3, 13 species of macrofungi were saprophytic, 1 were mycorrhizal, while 7 species were growing on a termite nest. The termite nest was the most favored substrate for macrofungi growth (7 spp.) followed by humid soil (4) and wood (4) supporting a moderate number of macrofungi. Lesser number of sandy soil (2), leaf litter (3) and Decaying wood log (1) species.

In the earliest history, mushrooms have been known to be consumed globally because of their various nutritional and medicinal attributes in fact these macrofungi were believed to provide strength for the Greek soldiers in war battles while the Romans have termed this as "Food of the Gods" and "Elixir the Life" for the Chinese (Valverde *et al.*, 2015). Currently there were various mushroom species that were reported to be edible and are consumed throughout the world. The most widely cultivated are the button and oyster mushrooms. In terms of consumption processes, it has been identified that the community have commonly prepared it as a Subji, fried, soup and spices for different dishes.

Table 2: Monthly distribution of edible macro mushrooms of Vansda National Park

Year	No of Species						
	June	July	August	September	October	November	December
2021	2	10	16	15	4	1	1
2022	3	15	15	12	5	1	1
2023	2	12	17	15	6	1	1

Table 3: Habitat diversity of edible macro mushroom of Vansda National Park

Major Type	Ecological Habitat	Macrofungi
Saprophytic	Humid Soil	*Agaricus augustus, A. campestris, A. subrufescens, Russula rosea*
	Sandy Soil	*Lepista nuda, Calvatia craniiformis*
	Wood	*Pluteus cervinus, Pleurotus albidus, P. dryinus, P. ostreatus,*
	Leaf litter	*Coprinus comatus, Macrocybe gigantean, Phlebopus marginatus*
Mycorrhizal	Decaying Wood Log	*Pleurotus cornucopiae*
Other	Termite nest	*Termitomyces clypeatus, T. fuliginosus, T. hemii, T. le-testui, T. microcarpus, T. tylerianus, T. umkowaan*

CONCLUSION

The study on the common mushroom species consumed by residents near Vansda National Park offers fascinating insights into the cultural and culinary importance of mushrooms in the area. These mushrooms, which are well-known to the locals by their native names, are prepared in a variety of ways, including soups and fried dishes, often with spices, highlighting their versatility in the local cuisine. The research underscores the value of these naturally occurring edible mushrooms, suggesting that their nutritional benefits could be maximized through the transfer of modern agricultural technology. The diversity of macrofungi in the region plays a crucial role in maintaining ecosystem health, and their potential benefits to human health are significant, thanks to their high protein content, vitamins, and overall nutritional value. The study also points out that the status of medicinal macrofungi, unfortunately, appears to be in an even more precarious state than that of edible species, which calls for urgent attention to their conservation and sustainable use. In summary, this research not only highlights the traditional knowledge of mushroom consumption in the region but also emphasizes the need for integrating technology and conservation efforts to enhance both ecological sustainability and human well-being.

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