

## DOCUMENTATION AND ETHNOMEDICINAL KNOWLEDGE ON WILD EDIBLE MUSHROOMS AMONG ETHNIC TRIBES OF NORTHERN ODISHA, INDIA

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### ABSTRACT

**Objective:** The objective of the present study was to document the diversity of wild edible mushrooms and their ethnomedicinal uses among different tribes of Northern Odisha through field survey, questionnaire, and interviews.

**Methods:** The study was conducted in the three adjacent districts of Northern Odisha. Collection was carried out in the month between June and December of 2014 from different habitats on the basis of local name of the mushroom, types of mushroom (edible or poisonous) and uses of the mushrooms (as food or medicine) among the different tribal communities by frequent field visits and has been documented and identified.

**Results:** The study revealed that more than 12 ethnic tribes of Northern Odisha were found to be mycophilia and have extensive traditional mycological knowledge. A total of 24 fleshy mushroom species were collected through field visits, out of which 19 species were found to be edible and were represented by 11 families and 11 genera. Among them, 14 species have been documented to have ethnomedicinal uses. The dominant mushrooms species belonged to genera of *Volvariella*, *Termitomyces*, and *Russula*. The study indicated that urbanization and changing lifestyles among the tribes have declined the uses and consumption of wild mushrooms.

**Conclusion:** There is urgent need to study and document indigenous knowledge systems to find innovative ways of tapping wild edible mushrooms for the welfare of mankind otherwise they will remain hidden in the forest and might become extinct.

**Keywords:** Wild edible mushrooms, Ethnic tribes, Northern Odisha, Ethnomedicines.

### INTRODUCTION

Mushrooms have long been used as a valuable food source and as traditional medicines around the world. Records of health promoting properties such as antioxidant, antimicrobial, anticancer, cholesterol lowering, and immunostimulatory effects have been reported for some species of mushrooms [1-3]. In eastern countries like China and Japan, the knowledge on the use of edible and medicinal mushrooms had been passed on from one generation to the other in documented form but it was not so in India. Thus, it is believed that some of this undocumented information on edible and medicinal mushrooms might have lost in our country. Despite this shortcoming, traditional mycological knowledge of most Indian ethnic groups has proven to be extensive and profound, consuming nearly 283 species of wild mushrooms out of 2000 species recorded world over [4]. Ethnomycological aspects were also dealt with by few workers in different parts of India and world over [5,6]. Some of the wild edible mushrooms have also been reported from Assam, Manipur, and Arunachal Pradesh of North East India [7-9]. In Central India *Ganoderma lucidum* is used as herbal medicine by the Baiga tribes to cure asthma and *Agaricus* sp. is used in goiter and *Lycoperdon pusillum* in wound healing and also for controlling bleeding [10]. Many ethnic tribes of western Assam such as Garos, Adivashis, Bodos, and Rajbangshis consume several mushrooms species as vegetables, but potentialities of such species are yet to be studied in detail [11].

Several researchers have shown the antimicrobial potential of numerous wild and edible mushrooms [12-18]. Both fruiting body and the mycelium contain compounds with wide-ranging antimicrobial activity [19]. In recent years, multiple drug resistance in human pathogenic microorganisms has developed due to indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. This situation compels scientists for searching new antimicrobial substances from various sources which are the good sources of novel antimicrobial chemotherapeutic agents [20]. Thus,

ethnomedicinal knowledge of wild edible mushrooms might provide useful information for discovery new therapeutic agents to combat growing health problems of the world.

Northern region of Odisha mainly Mayurbhanj, Keonjhar, and some part of Balasore districts, offers a wide spectrum of habitats and ecosystem due to diverse bio-geographic setting, horizontal and vertical dissimilarities, climatic contrasts and altitudinal variations. The tribal community namely Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia, and Birhor, live in the forests of Mayurbhanj and Keonjhar districts, exclusively depend on forest resources for their livelihood by practicing hunting, gathering, and collecting. Their world view is fully in consonance with the forest eco-system. The population of such tribes in Odisha though is small, yet their impact on the ever-depleting forest resources is very significant. Socio-politically they have remained inarticulate and, therefore, have remained in a relatively more primitive stage, and neglected too. These ethnic groups are the traditional collectors of the different mushrooms. The different kinds of edible and non-poisonous mushrooms that are consumed by them and the ethnomedicinal uses of those mushrooms vary with locality and the tribes. Recently some of the mushroom species of simlipal biosphere reserve (SBR), in the Mayubhanj district of Odisha such as *Russula vesca*, *Russula delica*, and *Termitomyces eurrhizus* were analyzed for their nutritional and mineral contents along with antioxidant and antibacterial potential [21]. However, indigenous knowledge about edible and medicinal mushrooms among the different tribes of this region has not been given significant attention.

In this present study, an attempt has been made to document the diversity of wild edible mushrooms through morphological and microscopical studies. Further, information on indigenous and traditional knowledge regarding the use of wild edible mushrooms for food as well as medicine purpose by few ethnic tribes of Northern Odisha was collected comprehensively through structured questionnaires.

## METHODS

### Study site

The study was conducted in the three adjacent districts of Northern Odisha i.e., Keonjhar, Mayurbhanj and Balasore (85°11'-87°29' East and 21°1'-22°32' North) and forms one of the mega biodiversity zones of the eastern India with a rich diversity of flora and fauna. The landscape of Northern Odisha comprises numerous rolling hills and the vegetation comprises of tropical semi-evergreen forest, tropical moist deciduous forest, dry deciduous hill forest, high level Sal forest, grassland, and savannah. The climate is tropical. Three distinct seasons are felt during the year. They include the rainy season (mid-June to mid-October), winter (mid-October to February), and summer (March to mid-June). The annual rainfall ranges from 1200 mm to 2000 mm and temperature ranges from 2°C to 48°C. The study area concentrates in and around the deep forest pockets of tribal villages and villages situated in the transitional zone of SBR. Besides, visit to 8 weekly markets in different parts of Mayurbhanj, Keonjhar, and Balasore district were undertaken and interviewed was conducted on sellers of wild mushrooms and their medicinal uses.

### Field survey and collection of data

Frequent field visits were also conducted and the information was collected on local name of the mushroom, types of mushroom (edible or poisonous) and uses of the mushrooms (as food or medicine) among the different tribal communities. The sites of mushroom collection and other related information was ascertained from the villagers in the locality. In total, 60 peoples were interviewed, among them 43 were men and 17 were women.

### Collection and identification of mushrooms

Collection was carried out in the month between June and December of 2014 from different localities of Mayurbhanj mainly SBR and some market places of Keonjhar and Balasore districts. The fleshy fungi were collected from different habitats such as meadows, decaying wood, rotting plant parts, termite nests in the forest area. Each of the collected samples were wrapped in wax paper and brought to the laboratory for identification purposes. Identification of various mushroom species were made using publication of Adhikari (2000) [22], Arora (1996) [23], Singer (1996) [24], and also identification was made on the basis of critical observations of specimens and Mycokey [25]. Further voucher specimens were preserved in 4% formaldehyde and deposited in the Department of Botany, Microbiology Division, North Orissa University.

## RESULTS

Altogether 24 different fleshy mushroom species were collected and identified from the three districts of Northern Odisha, India (Fig. 1). The mushroom species constituted nineteen edible species which were represented by 11 families and 11 genera (Table 1). The families were grouped under six orders and among them agaricales were dominated by 8 species followed by Russulales with 7 species. The other four orders consisted of one species each. Out of 19 wild edible mushroom species thirteen species were collected from forest soil, three species were collected from decaying paddy straw, two species were collected from termite nests, and one edible mushroom species was collected from wood log. The dominant mushrooms species belonged to genera of *Volvariella*, *Termitomyces*, and *Russula*. Species of *Geastrum* were rare and only found in Sal forest under decomposed leaves while *Termitomyces* species were found abundantly in and around termite nests (Fig. 2). Similarly, *Russula* species were found abundantly in forest soil substratum during the peak growing periods. The favorable time for collection of wild edible mushrooms in the study area begins with the onset of rains, the period when the conditions are conducive for the mushroom growth and these are available in more quantity.

The indigenous knowledge of wild edible mushrooms and their utilization were studied among 12 different tribal communities. The study indicated that most of the mushrooms species were used both as food or medicinal purposes, out of which 14 species have been documented to have ethnomedicinal uses by different tribes of Northern Odisha (Table 2). Some of the wild edible mushrooms species like *Termitomyces*, *Russula*, *Volvariella*, and *Tuber* are also being sold in local weekly market as a source of revenue (Fig. 3). However, the market values of these mushrooms were found to be very low as many people (mostly non-tribal groups) considered them to be poisonous and hence are not bought. Thus, the buyers are restricted among the tribes and some few elderly people who knew about the edibility.

## DISCUSSION

Wild edible mushrooms are important sources of food supplement for rural communities and have also been used to maintain health and increase longevity since thousands of years. In this investigation community, utilization and dependence on wild edible mushrooms was studied among 12 ethnic tribe of Northern Odisha. The study revealed that nineteen mushrooms species grown in wild are collected

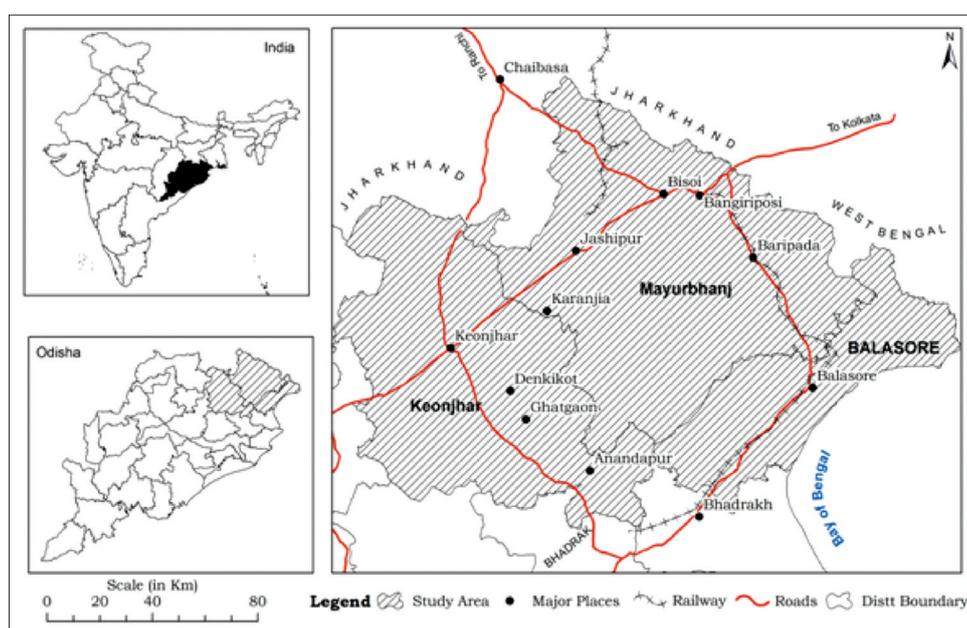


Fig. 1: Map showing study area (Northern part of Odisha)

Table 1: Wild edible mushrooms of Northern Odisha with their availability

Order	Family	Scientific name	Host/substratum	Population	Period of availability
Agaricales	Volvariaceae	<i>Volvorella volvacea</i>	Decaying paddy straw	Abundant	Throughout the year (fresh)
		<i>Volvariella</i> sp.	Decaying paddy straw	Abundant	May-December (fresh)
	Pluteaceae	<i>Volvariella glandiformis</i>	Decaying paddy straw	Abundant	June-November (fresh)
	Amanitaceae	<i>Amanita caesarea</i>	Sal tree forest soil	Moderate	June-November (fresh)
	Lyophyllaceae	<i>Termitomyces cartilaginous</i>	Termite nest	Abundant	June-October (fresh)
		<i>Termitomyces heimii</i>	Termite nest	Abundant	June-October (fresh)
	Agaricaceae	<i>Lycoperdon</i> sp.	Soil	Moderate	June-November
	Lycoperdaceae	<i>Calvatia utriformis</i>	Soil	Moderate	June-November
	Russulales	Russulaceae	<i>Russula cyanoxantha</i>	Soil	Moderate
<i>Russula</i> sp.			Soil	Moderate	June-November (fresh)
<i>Russula albonigra</i>			Soil	Moderate	June-November (fresh)
<i>Russula emetica</i>			Soil	Abundant	June-November (fresh)
<i>Russula virescens</i>			Soil	Moderate	June-November (fresh)
<i>Russula rosea</i>			Soil	Abundant	June-November (fresh)
<i>Lactarius</i> sp.			Soil	Moderate	June-October (fresh)
Boletales	Diplocystaceae	<i>Astraeus hygrometricus</i>	Sal tree forest soil	Rare	July-September (fresh)
Geastrales	Geastraceae	<i>Geastrum</i> sp.	Sal tree forest soil	Rare	July-September (fresh)
Cantharellales	Cantharellaceae	<i>Cantharellus</i> sp.	wood	Moderate	July-September (fresh)
Pezizales	Tuberaceae	<i>Tuber maculatum</i>	Soil	Abundant	June-November (fresh)



Fig. 2: Wild edible mushroom species of northern odisha (a) *Tuber maculatum*, (b) *Geastrum* sp., (c) *Volvariella* sp., (d) *Termitomyces* sp., (e) *Termitomyces cartilaginous*, (f) *Russula emetic*, (g), *Russula virescens*, (h) *Russula rosea*, (i) *Russula* sp.

and eaten by the tribal communities. Similarly, several workers have also reported wild edible mushrooms among ethnic tribes of India and around the world [5,26-28]. Wild edible mushrooms are known to have high nutritional value and are important sources of food supplement for tribal communities that live in consonance with nature and

heavily dependent on forest resources to solve malnutrition problem. Studies have indicated that wild edible mushrooms are not only important sources of food, but are also income generating livelihood for both developing and developed countries [29]. This becomes more relevant for tribal communities who depend mostly on non-timber

Table 2: Ethno-medicinal uses of wild edible mushrooms among different tribes

S No.	Local name	Species name	Tribal groups	Mode of use
1	Kuta Chatu	<i>Volvariella</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor;	Lowering high blood pressure
2	Gachha bedha	<i>Russula cyanoxantha</i>	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor;	Mostly used as food
3	Mati tara	<i>Astraeus hygrometricus</i>	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor;	The spore mass is blended with mustard seed oil, and used as a salve against burns. Act as a haemostatic agent
4	Mati tara	<i>Geastrum</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor;	Used to reduce staunch bleeding and reduce swelling
5	Parabana, Ada chatu	<i>Termitomyces reticulates</i>	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor;	Used in rheumatism and lowering high blood pressure
6	-	<i>Russula</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Mostly used as a delicious food
7	Kukuda	<i>Russula emetic</i>	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Mostly used as a delicious food
8	Pitha	<i>Lactarius</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to lower high blood pressure
9	Bali chatu	<i>Volvariella glandiformis</i>	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to lower high blood pressure and weakness
10	Anthua	<i>Lycoperdon</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to cure wound
11	Anthua	<i>Lycoperdon</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to cure wound
12	Jatia rutka	<i>Lycoperdon</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to cure wound
13	Desi rutka	<i>Tuber</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used to cure wound
14	Pija chatu	<i>Russula</i> sp.	Kharia, Mankidi, Santal, Kolha, Munda, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankidia and Birhor	Used in malnutrition, weakness and a delicious food item used by local people



**Fig. 3: Wild edible mushrooms of the study area: (a) Collecting wild mushrooms and interacting with old elderly person on its medicinal uses, (b) collection of wild edible mushrooms from forest by local tribal for food, (c and d) tribal women selling wild edible mushrooms in local market**

forest products for their livelihood. However, in the present study it was revealed that most of the wild edible mushroom species sold by the tribal communities were less demanding and fetched very low price. This was probably due to perception of the people who always considered wild mushrooms to be poisonous. Besides, many people were found to be quite ignorant about their edibility. Documentation and dissemination of knowledge on wild edible mushrooms would help the tribal communities to fetch a higher price and increase income generation. Further details of nutritional analysis and scientific study on their medicinal properties would also help in market demand of

these mushrooms species. Thus, utility and better marketing of wild mushrooms could contribute to improve the livelihoods and to reduce the poverty of the local communities.

Wild mushrooms are known to be rich sources of various bioactive substances [30,31] and many of them have been reported to be used in folk medicine for thousands of years [32]. In this investigation, 14 species have been documented to have ethnomedicinal uses by different tribes of Northern Odisha. Most of these tribes are still in the primitive state of living and depend upon nature for their food, shelter, medicine, fodder, fuel and other necessities of life. Thus, in spite of the network of primary health center and sub centers these tribes depend on their traditional healers and healing methods because of their availability, accessibility, and dependability. It was observed that most of the knowledge on medicinal uses of wild edible mushrooms was confined to old elderly people of the locality or village. In many instances, uses and doses of administration were given by traditional healer or practitioner (in local dialects, these people are known as *Vaidya*). Thus, documentation and ethnomedicinal uses of wild edible mushrooms by these tribes are an important approach for enhancing the understanding of indigenous knowledge systems. The utility and edibility of wild edible mushrooms are passed for one generation to their next generation. However, the influence of urbanization and modernization are changing the lifestyle of tribal people, so uses and consumption of wild mushrooms are slowly declining. Hence, there is urgent need to study such knowledge systems and find innovative ways of tapping their potential for the welfare of mankind otherwise these mushroom species will remain hidden in the forest and might become extinct. Although wild edible mushrooms have been widely reported from several parts of India, their documentation and medicinal uses from Northern Odisha which is basically a tribal dominated belt have not been studied in details except some few sporadic study by Sachan *et al.* (2013) [33], from SBR of Odisha. Currently, we are investigating the nutritional contents and bioactivities of the some selected wild edible mushroom species.

## CONCLUSION

Wild edible mushrooms have been utilized for food and medicines since thousands of years ago. They are important sources of food for tribal communities who mostly live in the forest and depend on natural resources for their livelihood. In recent times, depletion of forest areas and changing lifestyles of tribal people have limited the use of wild edible mushrooms for food and medicines. Demands for wild edible mushrooms are also very low because of ignorance and perception among the people on their use and edibility. This has changed the mindset of tribal communities to exploit them as a source of livelihood. Therefore, it is very important to document and generate the indigenous knowledge system on wild edible mushrooms to exploit them for the welfare of mankind. Further, scientific study on their nutritional contents and bioactivities may enhance the market demand of wild edible mushrooms species that might help the tribal communities in income generation for their livelihood.

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