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Indigenous knowledge of ethnic tribes for utilization of wild mushrooms as food and medicine in similipal biosphere reserve, Odisha, India

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Indigenous knowledge of tribal peoples for utilization of wild mushrooms is quite different in Similipal Biosphere Reserve, Odisha, India. Traditionally the tribes lived in and subsisted on the forests, but with increasing loss of forest areas, integration into mainstream society and urbanization, they are rapidly losing their traditional knowledge and culture. An effort has been made to record some of this precious indigenous knowledge through questionnaire survey, visits and interviews which were conducted with selected indigenous tribal communities in Similipal Biosphere Reserve (SBR) of Odisha, India. The knowledge about the wild edible mushroom flora of Similipal Biosphere Reserve and their uses by the indigenous tribes for food and medicine were documented. The study revealed that more than 10 enthnic groups (Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho and Mankdias) of SBR were found to be mycophilic and have extensive traditional mycological knowledge. In total 14 species of fleshy mushrooms belongs to 8 genera and 6 families were collected through field visits and identified by phenotypic and microscopic characters. All these mushrooms are being used by the tribes as source of food as well as ethnomedicinal purposes including cure for malnutrition, weakness and other nutritional disorders etc. The study highlights the diversity and ethnomedicinal potential of some indigenous mushrooms from SBR. Further studies in these mushrooms may be undertaken to discover active compounds for their possible pharmaceutical applications.

Key words: Wild mushroom, ethnic tribes, ethnomedicine, Similipal Biosphere Reserve

Introduction

Mushrooms have a long association with mankind and provide profound biological and economical benefit. The wild mushrooms have been traditionally consumed by man with delicacy probably, for their taste and pleasing flavor. They have rich nutritional value with high content of proteins, vitamins,

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minerals, fibers, trace elements and low/no calories and cholesterol (Wani *et al*., 2010). Many of them have been used in folk medicine for thousands of years. Among the wild edible mushrooms, some are neutralceuticals (natural food having potential value in maintaining good health and boosting immune system of the human body) while others can produce potent nutriceuticals (compounds that have medicinal and nutritional attributes and are consumed as medicines in the form of capsules or tablets but not as food) (Ribeiro *et al*., 2007). In the developed countries, mushrooms have become one of the most important products of all the horticulture crops. The production of mushrooms is increasing everywhere in the world and now a days cultivated mushrooms are available all the year round and they are used in enormous quantities to serve with all kinds of table dishes (Baruah, 2008).

Wild mushrooms are a valuable non-timber forest resources used by mycophilic societies and their use has been documented in many countries around the world (Jones and Whalley, 1994, Roberto *et al*., 2005). They are sold in traditional markets (Roberto *et al*., 2005) or commercially exploited as food (Pilz *et al*., 1999) or medicines (Chamberlain, 1996). 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 (Purkayastha and Chandra, 1985). Ethnomycological aspects were dealt with by few workers in different parts of India and world over (Harsh, *et al*., 1993, Bulakh, 2001, Adhikary *et al*., 2005). Some of the ethnomycological reports from India include the wild edible mushrooms from Manipur and Arunachal Pradesh of North East India (Sing and Sing, 1993, Sing *et al*., 2002), Sibsagar district of Assam (Baruah *et al*., 1971), Western Assam (Sarma *et al*., 2010) and Nagaland (Tanti *et al*., 2011).

Similipal Biosphere reserve (SBR) in the Mayurbhanj district of Odisha (India) is one of the tropical forest ecosystems rich in diversity of flora including mushroom. Some of the ethnic tribe viz. Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho and Mankdias are residing in the Similipal forests area (Panda *et al*., 2011). The origin and distribution of ethnic castes are found to localize in particular zone or area. 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 vary with locality and the tribes. Even the ethonomedicinal uses of the mushrooms are also vary with tribes.

In the present investigation, survey was conducted and some indigenous mushrooms was collected and identified through morphological and microscopical studies for the documentation purpose. Further, the information on indigenous and traditional knowledge regarding use of wild edible

mushrooms for food as well as medicine purpose by few ethnic tribes of SBR of Odisha was collected comprehensively through structured questionnaires in consultations as no scientific database is available yet.

Materials and methods

Study area

The Similipal Biosphere Reserve (Figure 1) is in the central part of the Mayurbhanj district of Odisha, eastern India (20°17' to 22°34'N and 85°40' to 87°10'E) covering an area of 5569 km^2 which forms one of the mega biodiversity zones of the country with a rich diversity of flora and fauna. The landscape of Similipal comprises numerous rolling hills. The vegetation comprises of tropical semi-evergreen forest, tropical moist deciduous forest, dry deciduous hill forest, high level Sal forest, grass land and savannah. The climate of the Similipal 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. The temperature ranges from 9.8°C to 33.5°C. The southern and western aspects are cooler and north-eastern aspects are warmer. Periodic earth tremors, thunder storms during the rains and dust storms in late May and early June are other characteristic features of Similipal.

There are 4 villages inside the core area, 61 villages in the buffer zone and 1200 villages in the transitional zone of SBR with a population of about 4.5 lakhs. Here tribes occupy a big chunk of the population constituting 73% of the total population; 53 communities both aboriginal and migrated are found in the SBR (Naik, 1998). The dominated tribes of the SBR are Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias etc. (Panda *et al*., 2011). Some of the tribes namely Khadia, Mankdias and Santals are still in the primitive state of living. They are mainly dependent on agriculture for food and also collect roots, tubers, leaves, flowers, fruits, and mushrooms as supplementary food. Tribal people mostly inhabit the forest area and depend on the forest resources for their livelihood.

Survey and sampling

Field visits were conducted and fleshy fungi were collected from Similipal Biosphere Reserve area of Mayurbhanj, Odisha during May 2010 to April 2011. Sample collection and survey was made in five different forest areas adjacent to Lulung, Baripada (Salbani forest), Bangriposi, Jashipur, Karanjia (Figure 1). The fleshy fungi were collected from

different habitats such as meadows, decaying wood, rotting plant parts, termite nests in the forest area. The site of mushroom collection and other related information was ascertained from the villagers in the locality. During the study, the information was collected on name of the mushroom, types of mushroom (edible or poisonous) and uses of the mushrooms whether use as food or ethonomedicine by tribals. In total, 60 peoples were interviewed, among them 43 were men and 17 were women.

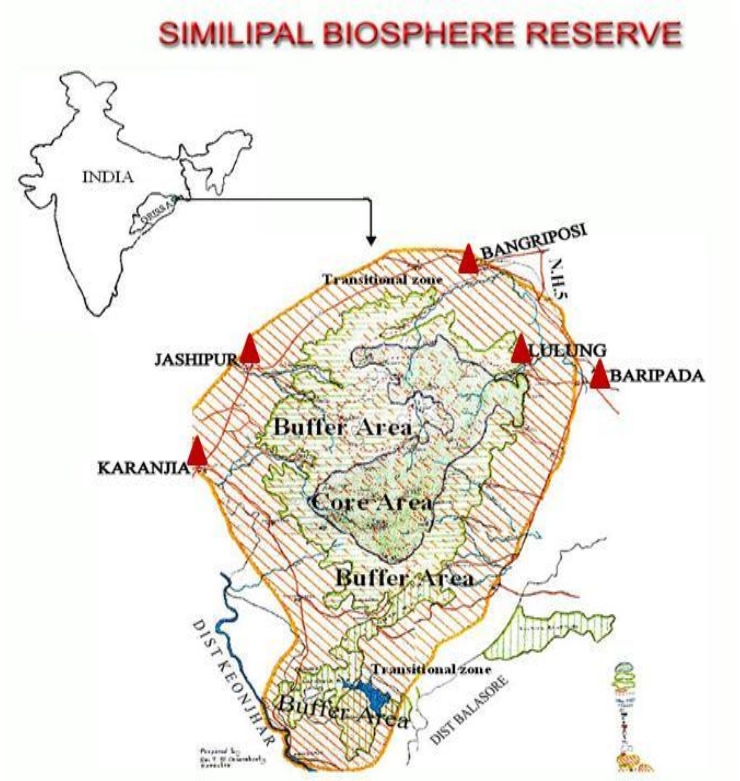

Fig. 1. Study area for collection of indigenous mushrooms and their information of ethnomedicinal uses by ethnic tribes from SBR ( )

The photographs of collected mushroom sample were taken in the habitat (Figure 2) and also the data of morphological characters such as habitat, shape, size, color, spore print color etc. were recorded. Each of the collected samples were wrapped in wax paper and brought to the laboratory for identification purposes. The identification of each sample was done with the help of standard manuals studying carefully different macroscopic and microscopic characters (Largent *et al*., 1977; Bilgrami *et al*., 1979; Purkayastha and Chandra, 1985). The samples were immediately brought to the camp for

preservation. Further, the collected samples (fresh and dried) were preserved in 4% formaldehyde and in paper or polythene bags respectively and numbered (Atri and Saini, 2000). All the identified specimens were deposited in the Herbarium of Department of Biotechnology, College of Engineering and Technology, Bhubaneswar, Odisha, India.

[A] *Russula emetica*

[B] *Russula delica*

[C] *Termitomyces eurrhizus*

[D] *Termitomyces* sp.

[E] *Agaricus silvaticus*

[F] *Agaricus* sp.

[G] *Volvorella* sp.

[H] *Lentinus* sp.

[I] *Pleurotus ostreatus*

[J] *Pleurotus* sp.

Fig. 2. Some wild edible mushrooms of Similipal Biosphere Reserve

Results and discussions

Mushroom survey in Similipal Biosphere Reserve (SBR) of Odisha revealed occurrences of wild edible fleshy mushrooms (fungi) are very rich. During the investigation, a total of 14 species of fleshy mushrooms belong to 8 genera and 6 families were collected and identified based on their morphological and microscopical characters (Table 1, 2 and Figure 2). The mushrooms identified in the SBR in the present study are native to many parts of India which were reported by some workers in the North Eastern Hills (Verma *et al*., 1995, Singh *et al*., 2007, Tanti *et al*., 2011); North Western Himalayas (Atri *et al*., 1997) and Kanyakumari district (Davidson *et al*., 2012).

The collected mushroom species were found to grow in different substratums. Some mushrooms such as *Russula emetic, Russula delica, Termitomyces eurrhizus, Termitomyces* sp., *Agaricus silvaticus, Agaricus* sp., *Lycoperdon* sp. were growing on soil while others like *Lentinus sajor-caju, Lentinus* sp., *Pleurotus ostreatus, Pleurotus* sp. and *Calvatia gigantea* were

found on dead wood logs. Similarly, the substratums of *Volvariella volvacea* and *Volvariella* sp. were decaying organic plant matter. In connection with the substratums of different mushrooms, the *Russula emetic* and *Russula delica* were abundantly found during the month of June to November. The *Termitomyces eurrhizus* and *Termitomyces* sp. were moderately found in between May to August and June to October respectively. The *Agaricus silvaticus* was moderately found with the rare mushroom of *Agaricus* sp. during June to September. The *Volvariella volvacea* was abundantly found throughout the year whereas *Volvariella* sp. moderately found during May to December. *Lentinus sajor-caju* and *Lentinus* sp. were abundantly found during July to November whereas *Pleurotus ostreatus* and *Pleurotus* sp. were moderately found in the season May to September and June to November respectively. The other mushrooms (*Lycoperdon* sp. and *Calvatia gigantean*) were rarely found during the season June to September (Table 1).

Table 1. Wild edible mushrooms of SBR with their availability

Order	Family	Scientific name	Host/Substratum	Population	Period of Availability	Accession No.
Agaricales	Russulacea	*Russula emetic*	Soil	Abundant	June-November (Fresh)	CETBT-05
		Russula delica	Soil	Abundant	June-November (Fresh)	CETBT-06
	Tricholomataceae	*Termitomyces eurrhizus*	Soil	Moderate	May-August (Fresh)	CETBT-07
		Termitomyces sp.	Soil	Moderate	June-October (Fresh)	CETBT-08
	Agaricaceae	*Agaricus silvaticus*	Soil	Moderate	July-September (Fresh)	CETBT-09
		Agaricus sp.	Soil	Rare	June-September (Fresh)	CETBT-10
	Volvariaceae	*Volvorella volvacea*	Decaying paddy straw	Abundant	Throughout the year (Fresh)	CETBT-11
		Volvorella sp.	Decaying paddy straw	Moderate	May-December (Fresh)	CETBT-12
Aphyllophorales	Polyporaceae	*Lentinus sajor-caju*	Dead wood logs	Abundant	July-November (Fresh)	CETBT-13
		Lentinus sp.	Dead wood logs	Abundant	July-November (Fresh)	CETBT-14
		Pleurotus ostreatus	Dead wood logs	Moderate	May-September (Fresh)	CETBT-15
		Pleurotus sp.	Dead wood logs	Moderate	June-November (Fresh)	CETBT-16
Lycoperdales	Lycorperdaceae	*Lycoperdon* sp.	Soil	Rare	June-September (Fresh)	CETBT-17
		Calvatia gigantea	Dead wood logs	Rare	June-September (Fresh)	CETBT-18

Various reasons were found for the choice of mushrooms consumed by tribals. The majority of mushrooms are consumed by tribals for their taste, followed by their nutritional purposes, availability, medicinal purposes, influence of neighbors and price affordability (Figure 3). Many of the edible species like *Russula emetic, Russula delica, Termitomyces eurrhizus, Termitomyces* sp., *Agaricus silvaticus, Agaricus* sp., *Volvariella volvacea, Volvariella* sp., *Lentinus sajor-caju, Lentinus* sp., *Pleurotus ostreatus, Pleurotus* sp. and *Lycoperdon* sp. were regularly collected by the tribal/local people during the season not only for their own consumption but also for sale in the nearby market.

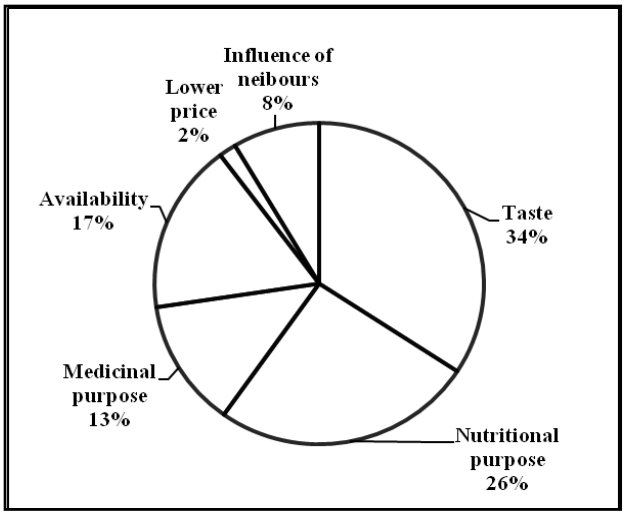

Fig. 3. Reason for choice of mushrooms by ethnic tribes of SBR

The survey conducted in villages located inside SBR revealed that all these mushroom species such as *Russula emetic, Russula delica, Termitomyces eurrhizus, Termitomyces* sp., *Agaricus silvaticus, Agaricus* sp., *Volvariella volvacea, Volvariella* sp., *Lentinus sajor-caju, Lentinus* sp., *Pleurotus ostreatus, Pleurotus* sp., *Lycoperdon* sp., *Calvatia gigantea* are used by several ethnic tribes like Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias living in this region for their food as well as ethnomedicinal purposes including cure for malnutrition, weakness, other nutritional disorder like diarrhea, high blood pressure, fever, asthama and wound etc. (Table 2). Briefly, *Russula delica* is used to prevent malnutrition as well as nutritional disorders. *Termitomyces eurrhizus* and *Termitomyces* sp. are used to treat rheumatism, daiarrhoea and high blood pressure. *Agaricus silvaticus* is used to lowering the high fever. *Volvariella volvacea* and *Volvariella* sp. are used to lowering the high blood pressure. *Lentinus sajor-*

caju and *Lentinus* sp. are used to cure cold and cough. *Pleurotus ostreatus* and *Pleurotus* sp. are used to cure asthma and lowering high blood pressure. Similarly, *Lycoperdon* sp. is used to cure wound. Some peoples reported that mushrooms are seldom used in their local traditional medicine because mushrooms are seasonal and are rare to come by. Those that incorporate mushrooms in their traditional medicine usually preserved them during their growing season through sun drying or smoke drying and powdered them for future use.

Table 2. Morphological characteristics of the wild mushrooms

Mushroom Species	Morphological characteristics
Russula emetica	Sporophores usually growing solitary or scattered on the ground in forest or in open places. Pileus 4.0-8.0 cm in diameter, convex to campanulate when young, then expanded, depressed when old, pink to red when young and pale red with age. Surface smooth and shining, slightly sticky when young, margin marked with streaks, finally somewhat sulcate. Gills whitish, some what crowded, short decurrent. Stipe cylindrical or narrowed near the top, 4.0-7.0 cm long. 1.0-2.0 cm thick, white, spongy but firm when young, fragile with age, solid without ring and volva. Basidiospores white, echinulate, 7.5-10.0 µm.
Russula delica	Sporophores usually growing solitary or in groups growing in symbiotic association with the roots of *Shorea robusta*. Pileus up to 15 cm in diameter, convex, some time infundibuliform, dull white, some time with rust colored patches, surface dry, often hairy when young, margin inrolled. Gills whitish, some what crowded, short decurrent. Stipe up to 6.0 cm long, cylindrical some times attenuated at the base. Surface glabrous. Flesh white, firm, no change on injury. Basidiospore 8.0-12.0x7.8 µm. Spore print white to creamish.
Termitomyces eurrhizus	Sporophores usually growing solitary on termite soil or near the termite nests. Pileus 3.0-9.5 cm. in diameter, at first convex, later expanded with prominent umbo, scales present on the surface, firm, margin regular, not incurved. Gills crowded, distinctly formed, free to subadnate, pliable, white, and entire. Stipe central, usually long (up to 20.0 cm long and 1.5-2.5 cm thick), white, somewhat tough, solid above ground. Hollow below the soil, penetrating the soil to some distance, pseudorhiza long and tapering, with persistent annalus, without volva. Basidia clavate, 4-spored, 22.9-25.5x6.8-7.6 µm. Basidiospores hyaline, ellipsoid, thin walled 6.8-9.3x5.1-6.8 µm. Spore print pink.
Termitomyces sp.	Spread of this fungus is quite striking; they are abundantly present in the grass field or termite disused nests. Cap- 1.9 to 2.0 cm in diameter; umbonate, yellowish grey in the margin; olive in the centre; Stipe long-5.2 cm., more or less straight, white, a part of it is inside the soil,nearly3.2 cm; basidia clavate, basidiospores 4 in number, smooth, hyaline, ellipsoidal 6.5- 7 x 3-4 µm; spore print white or grey.
Agaricus silvaticus	Sporophores grow on soil, stipitate, cap 2.9-8.75 cm. in diameter, campanulate at young stage, subumbonate at maturity; white, greysh brown at maturity; Gills disnict, crowded; stipe central, slightly narrow towards the apex, basidia 10.0-16.5 x2.9-8.0µm; Cheilocystidia clavate; basidiospores 4.2-5.2 x2.9-3.5 µm; spore print brown.
Agaricus sp.	Found scattered on pastures, lawns and on scattered manure. Pileus: 5-10 cm diameter, convex in young, flattened in old fruit bodies. White to pale-brown, finely scaly surface, margin entire. Gills: prominent, crowded free, white in young, pink to dark brown to blackish in older ones. Stipe: central, equal, 4-10 cm long, 1-2 cm

	thick, white to pale brown, annulate, annulus white membranous prominent. Basidia: 2 spored, spores brown, ellipsoid, 7x5.5 µm2. Spore print: sepia to brown.
Volvorella volvacea	Sporophores usually growing solitary or gregarious on rotten organic maters or rotten paddy straw heaps; centrally stipitate. Pileus usually 5.0-12.0 cm in diameter, often larger, campanulate at first, later becoming umbonate, usually grayish sepia but sepia near the umbo as well at the margin, presence of distinct radial sepia colored streak up to the middle of the pileus, soft and fatty to touch, margin sometimes split. Gills crowded, distinctly formed, free, thin, flesh colored with reddish tinge at maturity. Stipe central, cylindrical, attenuated upward, 8.0-14.0 cm long, whitish, ending below with a solid bulbous base, volva well developed and membranous with margin free. Basidia clavate, tetrasterigmatic, 18.7-28.9x6.8-11.9 µm. Basidiospores oval to ovoid, smooth, thin walled, 6.8-9.3x4.6-6.3 µm. Spore print salmon pink colored on white paper. Pleurocystidia lanceolate to clavate, 47.6-62.9x13.6-18.7 µm.
Volvorella sp.	Sporophores usually growing on rotten paddy straw, usually distinguished by its absence of pigmentation. Pileus 8.0-10.0 cm in diameter, hemispherical, sub-fleshy. Gills distant, white, ventricose. Stipe 6.0-8.0 cm longs, narrowed upward, 2.5-3.0 cm broad at the base, 0.8-1.0 cm at the top, solid, volva bilobed, brown, descending, margin curved, smooth. Hymenophoral trama inverse. Basidiospores pink. Spore print pink.
Lentinus sajor-caju	Sporophores growing in dead wood logs which are mostly composed; pileus 3.5-15.0 cm., margin of cap rolled in drying condition. The fruiting body colour pale white, brown, extremely tough, stalk central in position, 4-8 cm long; 0.5-1.7 cm. in diameter; eccentric, solid and cylindric, annulus present ,often lost at maturity volva absent; basidia clavate with 4-basidiospores; basidiospores-6.4-8.0x2.5-4.5 µm; pleurocystidia absent; cylindrical, smooth, hyaline, thin walled, well developed, solitary and stipitate.
Lentinus sp.	Sporophores growing in dead wood logs which are mostly composed; pileus 4.0-12.0 cm; margin of cap rolled in drying condition. The fruiting body colour pale white, extremely tough, stalk central in position, 5-8 cm long; 0.6-1.6 cm. in diameter; eccentric, solid and cylindric, annulus present ,often lost at maturity volva absent; basidia clavate with 4-basidiospores; basidiospores-6.3-8.0x2.6-4.5 µm; pleurocystidia absent; cylindrical, smooth, hyaline, thin walled and well developed.
Pleurotus ostreatus	Sporophores usually growing in clusters on dead tree trunk or branches and rarely on living trees, usually hygrophanous, whitish, large, tough, when old. Pilus 8.0-15. Cm or more broad, spathulate to kidney shaped, white, grey or some times yellowish after drying. Surface smooth, margin incurved. Gills crowded, decurrent, white, yellow when dry, broad. Stipe eccentric or lateral, 1.0-3.0 cm long, 0.5-2.0 cm thick, firm some times hairy at the base. Hymenophoral trama irregular, Basidia 4-spored, 30.0-38.0x6.0 µm. Basidiospores white, oblong, 7.0-10.0 µm long. Spore print lilac.
Pleurotus sp.	Sporophores solitary or groups occurring on decaying dead tree trunk or branches usually hygrophanous, whitish, large, tough, when old. Pilus 10.0-15.0 cm or more broad, spathulate to kidney shaped, white, grey. Surface smooth, margin incurved. Gills decurrent, white, yellow when dry, broad. Stipe eccentric or lateral, 1.0-3.0 cm long, 0.5-2.0 cm thick. Hymenophoral trama irregular, Basidia 4-spored, 30.0-38.0x6.0 µm. Basidiospores hyline, ellipsoid or cylindrical, 6.0-12.0 µm long. Spore print whitish.
Lycoperdon sp.	Fruiting body-1-4.5 cm across, solitary, globose or pyriform, mealy granules cover the exoperidium, endoperidium greyish brown, smooth, whitish to greyish brown; angiocarpic, gleba white, soft, fleshy at young stage, brown cottony at later stage; spores olive brown, spores 2.5-4.5µm. Edible when young.
Calvatia gigantea	Diameter of the sporophore 15-20 cm, exoperidium leathery, smooth, white for along period; gradually turning yellowish brown; spongy inside; at the top portion the sporophore splits gleba greenish yellow; spores globose, 3.3-5.2µm in diameter; spores ornamented sharp spines. Specimens at young stage are consumed.

Table 3. Traditional uses of some wild edible mushrooms by ethnic tribes of SBR

Mushroom Species	Ethnic groups	Traditional use and knowledge about wild mushrooms		Bio-prospective observation
		Food	Medicine	
Russula emetica	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	ND	Nutritious and delicious food item used by local people/tribal
Russula delica	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Used in malnutrition, weakness and nutritional disorder	Nutritious and delicious food item used by local people/tribal
Termitomyces eurrhizus	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Rheumatism, diarrhoea, lowering high blood pressure	Used in Rheumatism, diarrhoea, lowering high blood pressure
Termitomyces sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Rheumatism, diarrhoea, lowering high blood pressure	Used in Rheumatism, diarrhoea, lowering high blood pressure
Agaricus silvaticus	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Used in high fever	ND
Agaricus sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	ND	Nutritious and delicious food item used by local people/tribal
Volvorella volvacea	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Lowering high blood pressure	Nutritious and delicious food item used by local people/tribal
Volvorella sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Lowering high blood pressure	Nutritious and delicious food item used by local people/tribal
Lentinus sajor-caju	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Used in cold and cough	Play an important role in the decomposition and recycling of plant material
Lentinus sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Used in cold and cough	Nutritious and delicious food item used by local people/tribal
Pleurotus ostreatus	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Asthma and lowering high blood pressure	Nutritious and delicious food item used by local people/tribal
Pleurotus sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Asthma and lowering high blood pressure	Play an important role in the decomposition and recycling of plant material
Lycoperdon sp.	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	Used to cure wound	Nutritious and delicious food item used by local tribals and used to cure wounds
Calvatia gigantea	Santal, Kolha, Munda, Khadia, Bhumija, Bhuyan, Bathudi, Kudumi, Ho, Mankdias	They used as vegetable in their food	ND	ND

*ND-Not Determined

The mushrooms are very rich in proteins, vitamins, minerals, fibers, trace elements and low/no calories and cholesterol (Wani *et al*., 2010). These compounds are referred to as "host defense potentiators", which stimulate the immune system of humans (Marimuthu *et al*., 2004). Nutritional contents of the different species of mushrooms such as *Agaricus, Russula, Lentinus, Pleurotus, Volvariella, Calvatia* etc. were studied by various researchers (Agrahar-murugkar and Subbulakshmi, 2005, Pushpa and Purushothama, 2010, Manikandan, 2011) in India. Agrahar-murugkar and Subbulakshmi (2005) reported that *Calvatia gigantean* contains 27.3% protein, 1.0% fat, 6.3% ash, 22.0% fiber. According to Pushpa and Purushothama (2010), *Agaricus bisporous* contains 41.06% protein, 28.38% carbohydrate, 2.12% fat, 7.01% ash and 18.23% fiber and *Russula delica* contains 26.25% protein, 34.88% carbohydrate, 5.38% fat, 17.92% ash and 15.42% fiber whereas Manikandan (2011) revealed that 33.48% protein, 46.17% carbohydrate, 3.1% fats, 5.7% ash and 20.9% fiber in the *Agaricus bisporous*. Similarly the nutritional composition of other mushrooms such as *Lentinus edodes* (32.93% protein, 47.6% carbohydrate, 3.73% fat, 5.2% ash, 28.8% fiber), *Pleurotus ostreatus* (30.4% protein, 57.6% carbohydrate, 2.2% fat, 9.8% ash, 8.7% fiber) and *Volvariella volvacea* (37.5% protein, 54.8% carbohydrate, 2.6% fat, 1.1% ash, 5.5% fiber) were extensively studied by Manikandan (2011). It is clear from the above study that wild mushrooms provide a rich addition to the diet of the tribal peoples of SBR in the form of protein, vitamins, potassium, sodium, phosphorus and iron with low fat content. As the normal diet of SBR tribals is starch dominated, the mushrooms provide a balanced diet even though it is a seasonal food. The tribal peoples of SBR possess wide knowledge about the utilization of mushroom resources and lots of traditional knowledge. So far, wild edible mushrooms available in SBR of Odisha have not been documented and this is first report on the mushroom diversity and their uses by tribals of this region.

Conclusion

The documentation and use of wild edible mushrooms play a vital role in enrichment of the socio- economic life of the tribal peoples. Besides their consumption, the use of mushrooms in folk medicines also paves the way for the upbringing new industries. However, further studies need to be carried out in order to assess the fungal diversity of Similipal Biosphere Reserve of Odisha in a view to highlight their ethnomedicinal potentials for discovery of novel compounds for their pharmaceutical applications.

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