



Research article

Uses of wild edible macro fungi by Bodo community of Kokrajhar district, Assam, India

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Abstract: The study deals with ethnomycological knowledge of Bodo community of Kokrajhar district, BTAD, Assam. The community has extensive mycological knowledge on which they can easily differentiate the edibility of wild macro fungi and consume nearly 13–15 varieties that grow in wild mostly during the rainy season from May to September. Among different edible macro fungi the commonly occurring 5 species viz. *Volvariella volvacea*, *Agaricus semotus*, *Lentinus polychrous*, *Stropharia semiglobata* and *Termitomyces eurrhizus* belonging to family Plutaceae, Agaracaceae, Lentinaceae, Strophariaceae and Tricholomataceae were identified and their morphological characters were discussed along with the traditional method of recipe preparation by the said ethnic community.

Keywords: Ethnomycology - Macro fungi - Bodo community - Traditional recipe.

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INTRODUCTION

Mushrooms or macro-fungi are the fleshy, spore-bearing fruiting body of higher fungi (Mitra *et al.* 2013), typically produced above ground on soil or on their food source. They are edible as well as poisonous (Sharma 1989). The diversity of macro fungi occupies important place both in terms of their ecological and economic value. It has a very close association with the food habit of different ethnic tribe of Assam. Indigenous knowledge of edible macro-fungi and their utilization by tribal is an important component of ethno mycology (Das *et al.* 2014). Bodos are major ethnic tribal community of Assam most dominantly residing in the BTAD region (Lower Assam) which lies roughly in between (89°50' E to 96°10' E and 24°30' N to 28°10' N). It is one of the richest biodiversity zones in NE region of India. Since pre-historic times the wild macro fungi have been consumed by the indigenous people and it has been prized as an important source of natural dietary product and delicious food supplement (Sarma *et al.* 2010). They have acquired this traditional mycological knowledge from elders through oral transmission from generation to generation.

The availability of wild edible mushrooms and their ethno-mycological usage have been reported by many workers from different states of North-East India (Sing *et al.* 2002, Boruah *et al.* 1997). Paul *et al.* (2015) recently identified 13 species of macro fungi some of which are edible and ethnomycologically important from Ultapani Reserve Forest under Manas Biosphere Reserve. Wild macro-fungi have been used extensively in traditional systems of health and subsistence throughout the history. However, their actual food values and macro nutrients contents, edibility and medicinal properties have not been properly dealt (Jonathan & Fasidi 2003). Although many work on the availability of wild edible macro-fungi have been done from Assam (Sharma *et al.* 2010, Baruah *et al.* 1971) but report on ethno mycological knowledge of Bodo community and their traditional knowledge of using wild macro fungi is very rare. It is, therefore, an urgent need to document this traditional knowledge of using wild edible macro-fungi before it comes to an end among young generation. In view of the above an effort has been made to explore the number of commonly occurring wild edible macro fungi and document the ethnomycological knowledge of Bodo community.

MATERIALS AND METHODS

The field survey was carried out in different Bodo inhabited villages and forest areas of Kokrajhar district, BTAD, Assam. Local market survey was done to gather information from the local mushroom vendors and

study on their natural habitat has been carried out. The macrofungi encountered were collected in polythene bags and brought to the laboratory for identification. Specimens were preserved according to the method followed by Paul *et al.* (2015). The information on ethnic uses and methods of preparation of different cuisine from wild macro-fungi were recorded from elderly people of the said community. Identification of the species was done on the basis of macro morphological characters *viz.* size, shape, colour, texture, structure of the gills etc. and verified by comparing standard literatures. The classification and details identification of the macro fungi observed is labeled according to the classification proposed by Ainsworth (1973) given in the book “An Introduction to Fungi” by Dube (2005). Similarly, the plant substratum where the common wild edible mushrooms grow has been identified with the help of taxonomic literature (Baruah & Ahmed 2014, Kanjilal & Bor 2005).

RESULTS AND DISCUSSION

Preliminary investigation revealed that the Bodo community consumes nearly 13–15 varieties of wild macro fungi. During the survey we could identify five popularly used species of macro fungi belonging to family Lentinaceae, Agaracaceae, Plutaceae, Strophariaceae and Tricholomataceae which are saprophytic in nature and specific to their habitat (Table 1). Their diversity greatly depends on specific environmental condition of the habitat where they grows. The parameters like soil or substratum, temperature, moisture, light condition and rainfall plays a very important role in their growth and development. The wild macro fungi have been used as a delicious food supplement since prehistoric time by Bodo people. The harvesting of wild edible macro fungi is purely on the basis of the ethnomycological knowledge that has been passed from one generation to the next. The community people primarily gather this natural product for their own consumption as well as for earning livelihood by selling in local markets. The gatherers who usually choose mushrooms as food have good knowledge about the morphological appearance of the edible macro fungi and can easily differentiate the edible and poisonous macro fungi.

Table 1. Identified macro fungi varieties.

Mushroom Species	Class	Family	Local Name	Habitat/ Substrate
<i>Lentinus polychrous</i>	Basidiomycetes	Lentinaceae	Salni mwikhun	Dead Sal wood, wild
<i>Volvariella volvacea</i>	Basidiomycetes	Plutaceae	Jigabni mwikhun	Rotten Paddy straw
<i>Agaricus semotus</i>	Basidiomycetes	Agaricaceae	Mwikhun Ghai	Manure rich Soil
<i>Stropharia semiglobata</i>	Basidiomycetes	Strophariaceae	Mwikhun Jujai	Grassy areas inhabited by sheep and cows
<i>Termitomyces eurrhizus</i>	Basidiomycetes	Tricholomataceae	Mwikhun Hapaw	Abandoned termite nest infested soil

Although many wild varieties of macro fungi available grow in the forest patches of the region during the rainy season, but it has been learnt that only 3–4 species are extensively used for consumption and sold in the market. The most commonly preferred macro fungi are *Volvariella volvacea*, *Agaricus semotus* and *Termitomyces eurrhizus* which are commonly found to grow in wild during the month of May to September. Notwithstanding to grow a number of varieties, *Volvariella volvacea* is considered to be most delicious and it is highly priced and sold at around Rs. 70–80 per 250 gm. The wild macro-fungi are mainly collected by the villagers who are living adjacent to a forest patches and sell it in the local market. The consumption of wild macro fungi varies from region to region and the knowledge on macro fungi is extensive due to which the report on mushroom poisoning is very rare. The report of accidental consumption of wild poisonous mushrooms is occasional (3–4 cases yearly) and those who accidentally consumed poisonous mushrooms are reported to face problems such as nausea, vomiting, diarrhea, jaundice and hepatic or renal failure etc. but no causalities have been reported in the recent year which shows that the community people is well acquainted in differentiating the edibility of wild macro fungi.

Ethno mycological knowledge of Bodos in identification of edibility of macro fungi:

People from ethnic tribal societies have close association with and have good knowledge about forest resources (Das *et al.* 2014). Among different inhabitants of the region, mostly the Bodos collect the wild macro fungi and they are well aware of the existence of poisonous mushrooms and can differentiate them very easily from edible variety through their ethnomycological knowledge. The rare cases of mushroom poisoning among Bodos reflect the extensive mycological knowledge of Bodos in precise identification of edible macro fungi. However, they do not follow any standardized method to differentiate the edibility; they identify through visual

method and smelling the fruiting body. The knowledge not only provided an extensive idea to collect mushrooms as delicious food but also provided economic subsistence to the local people. Thus, documentation of such knowledge prevailing among Bodos may be helpful to identify edible mushrooms and avoid mushroom poisoning. The identifying features and knowledge that are used by Bodos to differentiate the edible and poisonous macro fungi is as follows (Table 2).

Table 2. Identifying feature between edible and poisonous fungi.

Edible	Poisonous
1. Macro fungi which have a clear distinct ring on the stalk at maturity.	1. Macro fungi directly grow on partially decomposed cow dung without ring and black gills.
2. Macro fungi having familiar and pleasant odour.	2. Macro fungi with peculiar and unpleasant odour.
3. Fruiting body or gills becomes red brown when harvested.	3. Colorful fruiting body whose gills bear black spots and turn black on breakage.
4. Stipe turns brown on breakage and when kept in water it releases brown colour in the water.	4. Stipe becomes black on breakage or when picked up from the soil.
5. Macro fungi grow in familiar substratum or death tree trunk viz. Gambari (<i>Gmelina arborea</i> L.), Sal (<i>Shorea robusta</i> Gaertn.), Taijou (<i>Mangifera indica</i> L.), Khwdwm (<i>Anthocephalus cadamba</i> Miq.), Taighir (<i>Dillenia indica</i> L.), Thalir (<i>Musa balbiciana</i> Colla.), Kantal (<i>Artocarpus heterophyllus</i> Lamk.), Jolpi (<i>Elaeocarpus floribendus</i> Blume.), Jiya (<i>Lansea grandis</i> A. Rich.), Sumli (<i>Bombax malabaricum</i> DC.), Kharo Khandai (<i>Oroxylum indicum</i> Vent.) and Sefang (<i>Stercospermum chelonoides</i> DC.)	5. Net Mushrooms known as ‘Jeymwikhun’ (<i>Bodo</i>); the macro fungi having net on its fruiting body are considered highly poisonous.
	6. Macro fungi on breakage release mucilage substance from stalk.
	7. Macro fungi when kept in a mixture of salt water along with lemon juice turns black or blue.

Different recipe preparation from wild macro fungi:

The wild macro fungi are used for preparing different delicious recipe by Bodos rather than using as medicine. During the rainy season when mushrooms flourish in wild, they are collected from the field and are eaten as a delicious food supplement with dinner and lunch. They have acquired their own technique of preparation of different recipe from wild macro fungi since time immemorial. Different types of local recipe are prepared according to their choice from wild macro fungi. The most common delicious and favorite local recipes are “Mwikhun Paja” (Mushroom Fry), “Ondlajwng Mwkunjwng” (Mushroom with Rice Gravy).

- i. **Mwikhun Paja** (Mushroom Fry) is prepared from the macro fungi with larger fruiting body as side dish. The macro fungi are collected and washed thoroughly with water and then sliced off and again kept in water to reduce the level of contaminant. It is prepared in a continuous heated metal pan called “Sarai” in *Bodo* with mustard oil and finely chopped onion and chillies. First, the oil is heated in “Sarai” and then 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, jheera powder and turmeric powder are added at different concentration to make its texture attractive and boiled for a few minutes until thick gravy is formed.
- ii. **Ondlajwng Mwkunjwng** (Mushroom with Rice Gravy) is another popular curry of Bodos which is being prepared with rice powder and some specific plants, edible roots or flowers and macro fungi. The macro fungi growing in tree trunk of *Gmelina arborea* Linn., *Shorea robusta* Gaertn. etc. and small sized saprophytic macro fungi such as ‘Mwikhun Jujai’ *Stropharia semiglobata* are used for preparing the same. At first mushroom is washed and sliced off and half fried with mustard oil, onion and green chillies and kept in a container. After that rice gravy is prepared with mustard oil, salt, chillies and garlic in hot water with powdered rice grain and “Kharwi” a traditionally prepared alkali material from the burnt ashes of the bark and other parts of local variety of banana, mustard plant, stem of sesame. Later the half fried mushrooms are

poured into the boiled rice gravy and allowed to cook. In order to make it more delicious sometimes meat like-duck, pork, chicken etc. and small fishes are being added.

Apart from this the macro fungi is also eaten with potato, poneer, chicken, pork etc. to enhance the flavor. Sometimes it is eaten by roasting which is known as “Menanwi Janai” in Bodo. It is prepared by exposing the mixture of macro fungi in ember. The macro fungi were collected first and then wash thoroughly and sliced off. After that the fungi are mixed well with mustard oil, salt, garlic paste and turmeric powder and wrapped with banana leaf and then put into the ember for cook. They prepared different local cuisine according to their individual choice. It has got a very important place in the food habit of Bodo community, so further development towards large scale cultivation mushroom based on wild edible varieties can promote the economic growth of the people of the region. It has also been recommended as food item contributing significantly to the protein nutrition of the developing countries like India (FAO) which can be used as an alternative against starvation because of its high protein and vitamin content. Therefore, cultivation and preservation of traditional mycological knowledge can also contribute to food security as it is easily available, affordable and usable for the poor from the wild (Das *et al.* 2014).



Figure 1. Some edible macro fungi: **A**, *Lentinus polychrous*; **B**, *Lentinus polychrous* growing on dead Sal wood; **C**, *Stropharia semiglobata*; **D**, *Volvareilla volvacea*; **E**, *Agaricus semotus*; **F**, *Termitomyces eurhizus*.

Identification and morphological description of the characterized wild edible macro fungi:

Lentinus polychrous : Commonly known as ‘Sal mwikhun’ (Bodo) grows singly or in clump on death Sal wood or decayed tree trunk rich in mosses and algal growth. The fruiting body is soft when young becoming tough at old, whitish brown in colour with the edge bent downward, finely dispersed brown scales is present on the surface of the fruiting body, stalk short measuring 2–3 cm, attached with the cap at the side (Fig. 1A). Pileus 3–8 cm, surface smooth, margin incurved, gills brown becomes black when dried and the fruiting body becomes leathery when dried. Fruiting body is used for consumption; good when eaten at young and mature one is tough. Spore print white.

Stropharia semiglobata : Common, grows gregariously in the field and other grassy areas inhabited by cows and sheep during rainy season and early winter. Commonly known as ‘Mwikhun jujai’ (Bodo). It is often eaten as an additive with different curry of Bodos. The fungus is small (Fig. 1C). Pileus 0.5–2 cm, semiglobate; soft, round, conical becoming nearly convex when matured, brownish to yellow, viscid, shiny, glabrous, smooth; margin regular, not splitting, non-striate; cuticle separable; context thin, pale unchanging; gills free brown and odor not distinctive. Stipe cylindrical, long 2–6 cm slightly bulbous at the base, hollow, surface brownish yellow, shredding at maturity; annulus absent, a narrow dark zone on the stipe is present near the apex representing the presence of evanescent veil. Spore print golden yellow.

Volvareilla volvacea : It is called paddy straw mushroom (Fig. 1D) commonly known as ‘Jigabni mwikhun’ (Bodo), which grows in solitary or gregarious in decayed paddy straw preserved for cattle feed slightly attached with the humus rich soil. The fruiting body is dark gray colour, brown to black on the top, gills crowded, distinctly formed, thin, flesh colored becomes brown when harvested. Stipe central, cylindrical, hollow with cottony presence, attenuated upward, 5–8 cm long, whitish, ending below with a solid bulbous base, volva well developed and membranous with margin free (Fig. 1D). Pileus usually 6.0–12.0 cm in diameter, soft and smooth, margin sometimes split when attains maturity. Spore print salmon pink colored on white paper.

Agaricus semotus : Common throughout Assam, grows singly or in group on soil where household’s cattle dung is disposed off in a specific spot for organic manure production. Commonly known as ‘Mwikhun ghai’ (Bodo). The fruiting body is round, convex when young becoming nearly flat when matured measuring 7–13 cm, white in colour with finely dispersed brown scales on the surface, centre of the cap darker (Fig. 1E), gills crowded free, smooth creamy white in appearance, stalk long nearly 6–13 cm with a distinct ring in the upper portion of the stalk, base somewhat thickened and bulbous.

Termitomyces eurhizus : Commonly found in Assam and other parts of India. Grows solitary on termite soil or near the termite nests, usually appears just after the pre monsoon showers. Fruiting body fleshy, 3- 7 cm in diameter; pileus glabrous, fleshy, with obtusely rounded perforations surface brown and off-white at margins, globose towards the centre; hymenophore lamellate; lamellae free to adnexed, cylindrical; Gills crowded, distinctly formed, free to sub adnate and white (Fig. 1F). Stipe central, usually long up to 20.0 cm, firm and sometimes with a bulbous base, surface white above and brownish below, spores sub hyaline, ellipsoid and smooth. Spore print salmon pink.

CONCLUSION

The identified macro fungi species grow in wild mostly during May to September. Diverse form of macro fungi has been reported to be present in different localities of Kokrajhar district and the inhabitants of the region consume nearly 13–15 varieties. Selective mushroom varieties are consumed by preparing delicious recipe. The knowledge about the edibility of wild edible macro-fungi is mainly restricted to only few elderly people. Therefore, proper documentation of this ethnomycological knowledge of using wild macro fungi is very important along with creation of data base of wild edible macro fungi of the region. And many varieties of the wild edible macro fungi which can serve as additional source of nutrition that are found to grow in the region are not reported earlier. Further study will reveal more information related to ethnic use and distribution pattern of wild macro fungi varieties. Therefore an extensive study is recommended for detail characterization of these economically important natural food products growing in different localities of the region.

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