

Culinary Status and Sociobiology of Termitophilous and Lepiotoid Mushrooms of North West India

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Abstract: The present paper gives an account of ethno-mycological and traditional knowledge about the seven edible species of *Termitomyces* viz., *T. microcarpus*, *T. radicans*, *T. badius*, *T. medius*, *T. heimii*, *T. striatus* and *T. mammiformis*, 3 *Macrolepiota* species namely *Macrolepiota procera*, *M. dolichaula* and *M. rachodes* mushrooms which are frequently hunted by local people of North West India during monsoon season. Their local names and different types of recipes prepared from them by the natives of North India are given in detail in the result and discussion section. Ethno-mycological information with respect to each one of them was collected using questionnaires, personal observations and interviews with the old and experienced persons and local informants.

Key words: *Termitomyces* • *Macrolepiota* • Mushrooms • Edible fungi • Basidiomycetes • Sociobiology

INTRODUCTION

Mushrooms remained as a delicacy in human diet since times immemorial. The therapeutic value of mushrooms has also been recognized by many of the early civilizations including Greeks, Aryan, Egyptians, Romans, Chinese and Mexican, etc. Greek warriors regarded them as strength food, Romans considered them as “food of God” whereas Chinese regarded mushrooms as “elixir of life”. In the Indian literature much referred “Somrus” was actually a decoction of mushroom [2]. The Aztecs of South America referred mushroom as “teo-nonacte” (God’s flesh) and worshipped a group of mushrooms as being divine.

The present chapter highlights the ethno-mycological aspects related to the culinary significance and other information pertaining to the usages of lepiotoid and termitophilous mushrooms in different parts of North West India. The investigations carried out revealed that many species of termitophilous and lepiotoid mushrooms are in regular use as articles of food during monsoon season throughout North West India.

MATERIALS AND METHODS

Fully mature samples of all species were collected from North West India during monsoon season and

ethno-mycological information with respect to each one of them was collected using questionnaire, personal observations and interviews with the old and experienced persons and local informants. Amongst the interviewees, about 30-40% was aware about the ethno-mycological uses out of which, majority (80%) were the elders (above 60 years of age). The specimens were dried in an open air wooden drier at 40-45°C [1] for preservation and further use. The dried mushrooms were used during off-season. During present enquiries from the local inhabitants, none of these mushrooms are being sold in the local markets.

RESULTS

The local inhabitants collected wild mushrooms freely from their neighboring localities/ forests for family consumption and for earning revenue by selling. Ethno-mycological information with respect to each one of them was collected seeking response to questionnaire containing following 13 questions, in which personal observations and interviews with the old and experienced persons and local informants was recorded in the field itself. Amongst the interviewees in the villages of the area surveyed, about 30-40% were aware about the ethno-mycological uses of mushrooms and majority (80%) of them were the elders (above 60 years). For the collection of information approximately 40 persons were

quizzed in Himachal Pradesh and Punjab. Following questions were put to them so as to gather the ethno-mycological data during survey from 2007-2011. Response of the people received against each question has been consolidated and given alongside respective question in summarized form in the ongoing account.

- Do You Eat Mushrooms? Many people in the investigated areas used mushrooms for food. People of Urban areas preferred the common white button mushroom from the markets while the rural folk collected edible mushrooms from their natural habitats for their consumption.
- Who in family collect mushrooms? In the villages, normally elders went out for mushroom hunting early in the morning. It included both men and women who do it every monsoon season on a regular basis.
- Which type of mushrooms is treated as edible? Following beliefs or ideas about edibility of wild mushrooms in the study area were common:
 - Carpophores with ring/annulus are avoided and treated as poisonous.
 - Carpophores found on rotting wood, dry stump of *Euphorbia royleana*, termite mounds, paddy straw are generally collected for consumption.
 - Carpophores growing on debris or rich humicolous soils are mostly treated as non-edible.
 - Carpophores, which are mild tasting thick, fleshed and peeled off easily and are eaten by rodents/snails, monkeys are treated as safe for human consumption.
 - Carpophores which are bad tasting or gives burning sensation on tongue when tasted raw and turns blackish or changes colour on exposure are considered as unsafe for human consumption.
 - Who taught you about collecting mushroom? Knowledge about utility of mushrooms percolates down the generation orally from elderly people whose families had lived in that area for years together.
 - Which types of mushrooms taste is the best? People were asked to group the mushrooms according to their preference. Termitophilous mushrooms with rooting stipe were considered to be the best while lepiotoid mushrooms received a least / average rating in consumer preference.
 - When, where and how are mushrooms collected? During the monsoon season mushrooms were collected on daily basis early in the morning from the adjoining localities and forests.

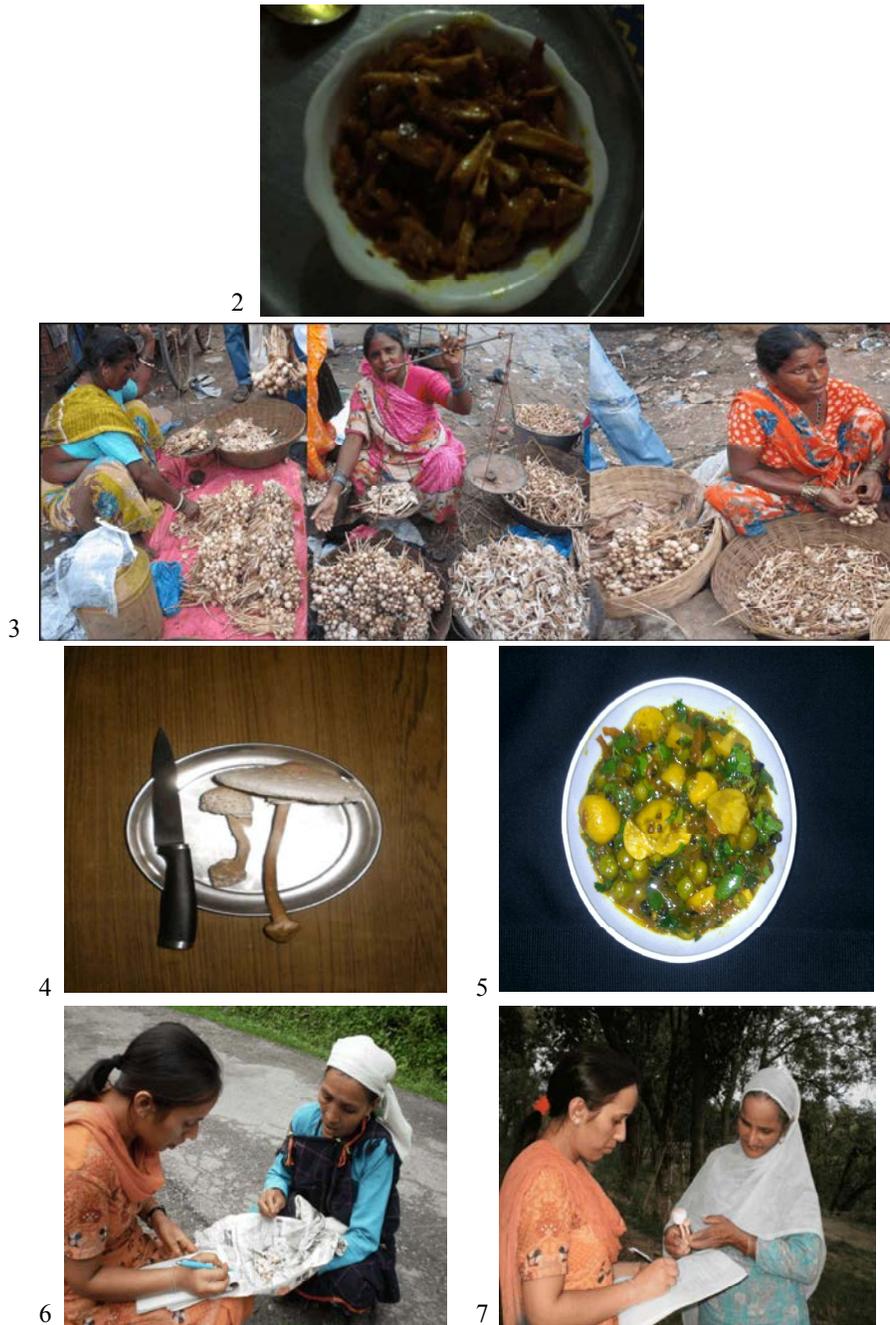
- How do people prepare mushrooms recipes for consumption? Preparations like mushroom curry with plenty of soup, mushroom mixed with other vegetables and peanuts, rice pulao, mushroom pickle, etc (Figs. 2, 4, 5) are commonly cooked recipes. They are mixed with ingredients like chopped tomato, onion, garlic, ginger, turmeric powder, coriander powder, chilies and cooking oil, depending on the individual purchasing capacity, taste and preference.

Recipe Composition:

- 250 gm fresh mushrooms (washed and sliced)
- 2 tsp ginger garlic paste
- 1 tsp coriander powder
- 1 tsp turmeric powder
- 2 tsp masala powder
- 1 chopped onion
- 1 chopped tomato
- 1 tsp chilly powder
- 1 tsp salt
- 4 tsp cooking oil
- 2 tsp chopped Coriander leaves
- Time 10-25 minutes.

Recipe Preparation: For the purpose of cooking thick fleshed mushrooms (*T. heimii*, *T. striatus*, *T. mammiformis*) with long pseudorrhiza and all *Macrolepiota* species are first washed with tap water followed by chopping and subsequent steeping in lukewarm water for final washing. The chopped pieces of onion, tomato, garlic, ginger, etc are gently heated along with other spices in a frying pan in cooking oil until these turn light brown. The chopped cleaned mushrooms are added to the frying pan with gentle stirring and the required amount of salt was added. The cooking was done for 20-25 minutes under low flame. Water is added depending upon the type of recipe. As compared, the small sized fragile *T. microcarpus*, *T. radicans*, *T. medius* and *T. badius* are also cooked as above and are normally mixed with rice and peanuts after thorough washing and cleansing in a pressure cooker. It takes about 10 minutes time to prepare recipe of these small size fragile mushrooms. Many a times few varieties of edible mushrooms are cooked together.

- Do you preserve mushrooms? Most of the rooted termitophilous mushrooms are sun dried for use in winter months by the local inhabitants of Himachal Pradesh when most of the areas in H. P. are snow



Figs. (1-7): 1: Local inhabitant of Shekhupura (Patiala) collecting *Termitomyces microcarpus* for consumption. 2: Prepared recipe from *Termitomyces heimii* 3: Sale of fresh termitophilous mushrooms by tribal people in local markets in India, 4 and 5: Preparation and dish of *Macrolepiota* and *Termitomyces* by local inhabitant of Ropar (Punjab) and Mandi (Himachal Pradesh), 6 and 7: Gathering information about edibility, local name, recipes, from local women of Barot and Sarkaghat of Mandi (H.P.)

bound. Now the use is declining with the introduction of off season vegetables and other cash crops. Our observation indicates that the region represents a

mycophilic society and gathering of wild mushrooms is a traditional activity amongst the inhabitants of the area.

Table 1: Local names of commonly consumed mushrooms

Sr. No.	Scientific name	Local name	Uses and Edibility status
1	<i>Termitomyces microcarpus</i> , <i>T. radicans</i> , <i>T. medius</i> , <i>T. badius</i>	<i>Bhatolian</i> , <i>Baat koir</i> , <i>Mohtran</i> (Mandi, Sirmour, Hamirpur, Kangra of H.P.)	Used as a food, from edibility and nutritional point of view these mushrooms are well known.
2	<i>T. mammiformis</i> , <i>T. striatus</i> , <i>T. heimii</i>	<i>Goal Tatmour</i> , <i>Joru Koir</i> (Mandi, Kangra, Hamirpur, Sirmour of H.P.)	Used as food, They have higher consumer preferences due to their unique flavor and texture.
3.	<i>Macrolepiota procera</i> , <i>M. dolichaula</i> , <i>M. rhacodes</i>	<i>Kandi Koir</i> , <i>Tatmour</i> , <i>Badi Chattri</i> (Mandi, Kangra, Hamirpur, Sirmour of H.P.)	Used as common food, due to their large size, good flavor and edibility.
4.	<i>Lepiota cristata</i> , <i>L. clypeolaria</i> <i>Leucoagaricus albidus</i> ,	<i>Laseri</i> , <i>Chaachi</i> , <i>Goal Tamotar</i> (Mandi, Barot, Kangra, Hamirpur, H.P.)	Used as food, good from edibility point of view.

- What are vernacular names of these mushrooms? These mushrooms are known by variety of local names in North India viz., Khukh, Cheon, Tatmour, Tamotar, Mohtran, Joru Koir, Kandi Koir, Koir, etc. (Table 1).

Amongst the small sized edible termitophilous mushrooms *T. microcarpus*, *T. radicans*, *T. medius* and *T. badius* are locally known as Bhatt Koir, Bhattoliyan, Mohtran in Sirmour, Mandi, Hamirpur and Kangra districts of Himachal Pradesh (Table 1). In Sirmouri and Mandayali dialect "Bhaat, Bhatoliyan" refers to rice preparation and Mohtran refers to growing in gregarious formation at one place. These are excellent mild tasting whitish mushrooms with typical mushroom flavor and soft texture. Being miniature sized these are gathered in bulk from the termite mounds during rainy season. Normally these are mixed with rice to prepare rice pulao. Besides, being available in sufficient quantity these can also be cooked as normal vegetable or mixed vegetable and even as mushroom soup. These mushrooms are normally consumed fresh.

Large sized fleshy rooted mushrooms, namely *T. mammiformis*, *T. striatus* and *T. heimii* are commonly known as Joru Koir in Sirmour and Tatmour in Mandi, Hamirpur and Kangra districts of Himachal Pradesh. Joru refers to rooted mushrooms in Sirmouri and Tatmour refers to standing straight in Mandiyali and Kangri dialect. They have higher consumer preferences due to their unique flavor and fleshy texture. Like small sized termitophilous mushrooms, these are also consumed fresh. Very rarely, these are pickled.

Amongst the edible lepiotoid mushrooms *Macrolepiota procera*, *M. dolichaula* and *M. rhacodes* are commonly known as Kandi Koir and Tamotar (Table 1). Kandi Koir in Sirmouri dialect refers to mushrooms with annulus (Kandi) on the stipe and Tamotar in Mandiyali dialect refers to mushrooms with a big umbrella like structure. These mushrooms are common

in open grassy lawn and forested areas. They are commonly hunted due to their good flavor and consumer preference. These mushrooms are also cooked when fresh. No information is available about their drying and pickling.

Lepiota cristata, *Leucoagaricus albidus*, *Lepiota clypeolaria* are commonly referred as Laseri, Chaachi, goal tamotran in Mandi, Hamirpur and Kangra districts of Himachal Pradesh (Table 1). These are mostly collected from the forested areas for human consumption during monsoon season. In comparison to termitophilous and macrolepiotoid mushrooms, these are not very popular.

- Are these mushrooms sold in the local market? During monsoon season wide variety of mushrooms are being collected in bulk including those inhabiting termite mounds for consumption and earning revenue. Some of these mushrooms like *T. heimii* and *T. mammiformis* are thick fleshed and have been reported to be sold by the vegetable vendors in the roadside markets in Chattisgarh and North Eastern part of India (Figs. 3). Atri *et al.* [3] elaborated the edibility and sociobiological aspects of these mushrooms in Punjab state and reported selling of these mushrooms to the consumers @ Rs: 20-25 for 250 gm of fresh mushrooms. During present enquiries from the local inhabitants, none of these mushrooms are being sold in the local markets.
- How many inedible types of mushrooms do you recognize? Few of the inedible taxa were reported from different localities of Northern part of India when enquiries were made from the local inhabitants. These included species of *Amanita*, *Chlorophyllum molybdites*, *Leucocoprinus birnbaumii*, *L. cepaestipes* and those growing on dung and leaf litter, etc. However, none of the termitophilous mushrooms were there in the list of inedible types and all of them were reported to be edible.

- Do you know any myth, beliefs and stories about these mushrooms? People of investigated areas reported some mythical ideas about the appearance of these mushrooms. As in the historical literature, their sudden appearance is normally linked to the thunder - storm and lightening during monsoon season.
- How are these mushrooms used as medicines? During the survey on ethno-mycological information from the medicinal and cultural perspective, preparations from termitophilous mushrooms were the most important. Respondents possessed scanty information about the uses of these mushrooms for medicinal purposes. Only few of the medicinal uses like use of mushroom soup for persons suffering with indigestion and anemia were documented.

In this way several aspects of ethno-mycological information on these mushrooms have been obtained. Ethno mycology findings of this study showed that all the species of termitophilous mushrooms and few of the lepiotoid taxa are in use from the wild for consumption during monsoon season throughout North West India. There is well organized network for collection and local level trading of edible mushrooms in the collection area and majority local inhabitants particularly elders are quite familiar about the time of appearance of the edible mushrooms, their niches, edibility and marketing.

DISCUSSION AND CONCLUSION

Edible wild mushrooms are traditionally used in many Asian countries as food and medicine [3-9]. Various medicinal uses were reported by Nakalembe *et al.* [10] for many species of termitophilous mushrooms *viz.*, *T. microcarpus*, *T. aurantiacus*, *T. eurhizus*, *T. clypeatus* and *T. tyleranus*. Amongst various termitophilous mushrooms *T. microcarpus* has been reported to serve as a medicinal mushroom for the treatment of abdominal discomfort in newly borne babies, measles, cough, whooping cough, tuberculosis, delayed labor in women, postnatal bleeding in mothers and treatment of umbilical cords in newly borne babies and diseases linked to high blood lipids [10-11]. As compared during the present investigation it was documented that different lepiotoid and termitophilous mushrooms are in use for culinary purposes but none of them except *T. microcarpus* is known for medicinal utility for treatment of indigestion and malnutrition.

During the survey, it was found that respondents in the urbanized areas hardly possessed any information about their edibility. However, in the rural areas some respondents above 60 years possessed substantial know-how about their edibility, recipes and medicinal utility particularly their use in the form of soup for the persons suffering with indigestion, malnutrition and anemia. Because of the importance attached to these due to their culinary relevance different mushrooms are popular by variety of their folk names in the areas of their occurrence for example *Macrolepiota procera* as “Kandi Koir, Tatmour, Badi Chattri”; *Termitomyces microcarpus* as “Bhat Koir, Bhatolian” and *T. heimii* and other such species with long rooting pseudorrhiza as ‘Joru Koir, Goal Tatmour,’ etc. These are regularly collected during the monsoon season for personal consumption and some of them like *T. heimii* and *T. microcarpus* for earning revenue by selling these in bulk to local vendors [9]. This is also a regularly practice in the other parts of the country as well [12-16]. In this way several aspects of ethno-mycological information on these mushrooms have been obtained. Appearance of most of these mushrooms was highly predictable in time and such patterns are well familiar with local people. Ethno-mycology findings of this study showed that all the species of termitophilous mushrooms and few of the lepiotoid taxa are in use from the wild for consumption during monsoon season throughout North West India. There is well organized network for collection and local level trading of edible mushrooms in the collection area and majority of the local inhabitants particularly elders are quite familiar about the time of appearance of the edible mushrooms, their niches, edibility and marketing. Documentation of information on edible, medicinal and poisonous mushrooms as well as the different social and cultural practices associated with their use in ethno-medicinal practices in different parts of India is very important to sensitize the communities about the value of these mushrooms.

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