

ETHNOMYCOLOGY IN THE “TACANÁ VOLCANO BIOSPHERE RESERVE”, CHIAPAS, MEXICO

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ABSTRACT

In order to contribute to the rescue of the fast disappearing knowledge of mushrooms and their use held by the Mam ethnic group living within the “Tacaná Volcano Biosphere Reserve”, in Chiapas, Mexico, the use and knowledge of mushrooms was investigated by applying open unstructured and spontaneous interviews, to elderly speakers of the Mam language who were presented fresh biological material. Of the 50 fungi shown, informants acknowledged 16. Some names of mushrooms in Mam have no meaning in Spanish or Mam although phonetically some names are very similar to Spanish words. Most mushrooms are used for food, important mushrooms include *Lycoperdon umbrinum*, which is both edible and medicinal, *Amanita muscaria*, which is poisonous and used as cattle feed and *Agaricus sylvaticus* known as Xch’kbi lak’ in the Mam language. The Mam-speaking inhabitants have developed ways of preparation and treatment for mushroom consumption and can identify mushrooms depending on the shape, appearance (mature or immature) and size they present. It is stressed that the knowledge of mushrooms possessed by this ethnic group at the studied site, is limited and on the threshold of disappearing.

Keywords: wild edible mushrooms, Mam, traditional use of mushrooms, toadstools

INTRODUCTION

The knowledge and use of mushrooms in pre-Hispanic cultures located in what is now Mexico, played an important role and has been widely documented. Currently, in certain regions of the country, the mushroom-gathering tradition still persists and is carried out by the whole family for self-consumption (food, medicinal or religious purposes) and selling [1,2]. Empirical knowledge about the properties of mushrooms is part of the culture of many ethnic groups in this country. Many groups are able to differentiate between edible, poisonous and medicinal mushrooms [1].

Like other states in the country, Chiapas is known for its rich cultural and linguistic diversity. Of the 41 indigenous languages spoken, Tzotzil and Tzeltal are the most widespread, accounting for 36% and 34.4%, respectively. Mam is among the less represented languages; Mam speakers constitute 0.75% of the total indigenous population in the state [3] and live in isolated communities, in the mountains of the Sierra Madre de Chiapas, which border Guatemala [4]. The Mam ethnic group belongs to the mayatotonaco group, Mayantrunk, Mayan family, Yax sub-family and features 4 dialectal variants. These variants are comprehensible between each other mainly because the Mam settlements are geographically relatively close [5, 6]. Mam means father, but also has other meanings and names, including “mem” (stuttering, dumb) or “mame” (grandfather). The group is now known as Mam, Mameortokiol, all interchangeable terms [6-8].

In Chiapas, there are few studies on fungi, and even fewer on the knowledge, use and cultural significance that mushrooms have within a community. It is therefore important to recover cultural, nutritional, medicinal and artisanal knowledge, providing an insight that can be beneficial in everyday life. Mushrooms may be considered by certain ethnic groups as more important than plants and/or animals. The aim of this study was to contribute to the rescue of mushroom knowledge and use by the Mam ethnic group in the Tacaná Volcano Biosphere Reserve; justified by the fact that studies of this nature have not been carried out in the reserve, and that the Mam ethnic group and culture is characteristic of this area but is fast disappearing, together with their culture and knowledge.

The Tacaná Volcano Biosphere Reserve

The Tacaná Volcano Biosphere Reserve (TVBR) is located between coordinates 15° 00' 36'' - 15° 12' 00'' LN and 92° 00' 17'' - 92° 15' 00'' LW; and includes the municipalities of Tapachula, Cacahoatán and Unión Juárez, covering an area that stretches from north west of the city of Tapachula to the border with Guatemala (Figure 1) (9, 10). The altitude of the study area ranges from 1300-4100 m above sea level; the prevailing climate is (A) of semi-warm, humid temperate (according to Köppen), rainfall between summer and winter (May to October), with temperatures of over 18°C, April being warmest. The mean annual temperature is 20°C, while the highest areas present a mean annual temperature of 10°C (10, 11, 12). Ecosystem types include: moorland, high and medium evergreen forest, montane cloud forest, pine and oak forest; with 56% of the area comprising of high and medium evergreen forest, 25% montane cloud forest. Montane rainforests (9,13) are present in some eco-regions of the Sierra Madre de Chiapas.

Mushrooms in the TVBR

Previous reports indicate that there is significant mycological diversity in Chiapas. For a review of the work reported, we suggest revising the work of Andrade and Sanchez (14). Other later reports include: Ruan-Soto (15), focusing on the Ethnomycology of the Lacandon Jungle; Chanona-Gómez *et al.* (16) who studied macrofungi in Laguna Belgica Educational Park, Municipality of Ocozacoautla Espinosa, Chiapas; Alvarez-Espinosa (17) on the diversity and abundance of macrofungi in San Jose Bocomtenelté Educational Park, Municipality of Zinacantán; and a study by Alvarado-Rodriguez (18) that details Zoque ethnomycology in the town of Rayon, Chiapas. The only mycological study of the Tacaná Volcano Biosphere Reserve was carried out by Perez-Ibarra (19) consisting of a list of macroscopic fungi that grow there during the rainy season from June to November. In this study, 42 species (37 ascomycetes and 5 basidiomycetes) were reported. Of these, fourteen species were edible. Furthermore, 13 new species for Chiapas were recorded: *Amanita fulva*, *A. gemmata*, *Armillaria ostoyae*, *Cantharellus cinnabarinus*, *Cyathus limbatus*, *Helvella lacunosa*, *H. macropus*, *Lycoperdon flavotictum*, *Ramaria botrytis*, *Russula emetica*, *R. sanguinea*, *Tremella mesenterica* and *Tricholomopsis formosa*.

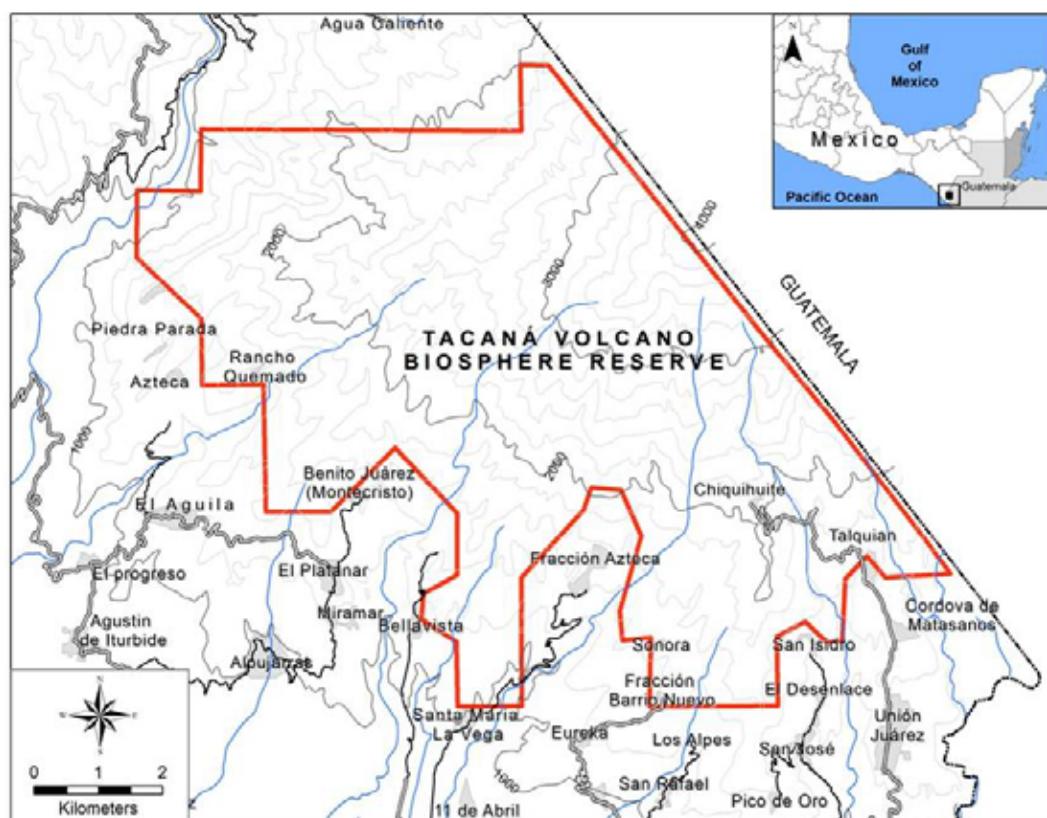


Figure 1. Location of Tacaná Volcano Biosphere Reserve
Source: Geographic Information Lab (LAIGE) ECOSUR-Tapachula

MATERIALS AND METHODS

Study Subjects and location

The study concentrated on people that lived within the reserve and that could speak Mam. 15 people with these characteristics were detected, of which 11 were selected for this study. Study subjects averaged 65 years of age, ranging from 41 to 80 years. At all times Spanish was spoken; a Mam teacher from the local community helped with translating and any problems with communication.

We searched for and collected mushrooms at various sites within the TVBR. Our transect followed an already established route, well known by the inhabitants of the community, that runs from the village of Chiquihuites to the volcano summit. Mushroom gathering took place during the rainy season, from May to October, on a monthly basis. The biological material collected was described according to its morphological and ecological characteristics, according to Diaz-Barriga [1]; mushrooms were immediately placed in paper bags with their corresponding record; and carried in a plastic basket to facilitate transport on the steep volcano slopes.

Interviews

Open and informal interviews were applied (in the form of talking) on the importance and use given to mushrooms in this region [21]. Fresh biological material was subsequently shown to interviewees. The topic of the interviews was not limited to mushrooms, but included some economic, social and historical aspects, among others, all to avoid the stress of a formal “interrogation” [22].

The questions focused on the concept native people have on mushrooms, nomenclature, use, phenology, the source (substrate), location; and criteria for the identification of poisonous and medicinal mushrooms, preparation use, abundance and quality [23]. The interviews were conducted during the six months we spent collecting biological material. The questions did not change and were applied to the same informants and at the same site, as suggested by Martinez-Alfaro [24].

Drying and identification of mushrooms

The collected material was transferred to the facilities at the Ecosur Research Centre –in the city of Tapachula. They were dried, labeled and preserved in the mycological collection for further studies. Mushroom identification was carried out according to the literature. The characterization and dehydration methodology used was as proposed by Cifuentes *et al.* [25]. For taxonomic determination, standard techniques (26), and various general taxonomic keys [20, 27- 37] were used.

Analysis of results

Information obtained during the interviews, was recorded in a field notebook. The data obtained from the informants was organized to produce tables and graphs (38). The information collected was analyzed so that it could be categorized into a dynamic constant comparison based on literature; each category was designated with a descriptive name [39].

RESULTS AND DISCUSSION

In this study, mushroom collecting concentrated on species that the respondents use or know. Most of these mushrooms are large, so little emphasis was put on the collection of smaller fruiting bodies. Eleven people with Mam origins were selected and interviewed and more than 100 specimens of mushrooms (of which 50 were shown to the interviewees) were obtained belonging to the Basidiomycota and Ascomycota phyla.

The eldest respondents did not visit the places where the collections were made. They mentioned that mushrooms are scarce and have been increasingly harder to find. They also point out that few children and young people in the community have any knowledge related to mushrooms, indicating that the tradition is not being transmitted to the new generations.

The number of specimens recognized by respondents was 16. Table 1 shows the scientific name and name in Mam for each mushroom. It is noteworthy that three of the 16 were not found (white mushroom *Pleurotus* sp, cob *Morchella* sp. and

Table 1. Mushrooms known by the Mam ethnic group living in the Tacaná Volcano Biosphere Reserve, Chiapas, Mexico

Common Name	Name in Mam	Scientific Name	Fruiting period	Nutri-tion*	Substrate	uses
Red mushroom	Tx'iag'taporJak'tap	<i>Lactarius</i> sp.	May to August	M	Chicharro tree (<i>Platymiscium dimorphandrum</i>)	Edible
White mushroom	Sak'it'zajorXa'ig'zak'	<i>Pleurotus</i> sp.	April	S	Alis tree (<i>Alnus</i> sp.), canac (<i>Chirantodendron pentadactylon</i>), and elder (<i>Sambucus</i> sp.)	Edible
Cob mushroom	B'aj'lag'orB'aj'lak'	<i>Morchella</i> sp.	May to August	M	Ground around pine (<i>Pinus</i> sp.), pine leaves	Edible
White mushroom (in closter)	Rechum, Twi tok or Kui tok	<i>Sparassis crispa</i>	June to July	M	Cajete trunks**, Check fire tree**, coffee tree (<i>Coffea</i> sp.)	Edible
_____	Xch' kbi lak'	<i>Agaricus sylvaticus</i> <i>Macrolepiota procera</i>	May to June	S	soil, sheep manure	Edible
SquirrelClaw	X'ix'k'ku'ku	<i>Schizophyllum commune</i>	May to August	S	Guarumo tree (<i>Cecropia</i> sp.)	Edible
Little yellow mushroom	X'ul	<i>Cantharellus cibarius</i>		M	Alis tree (<i>Alnus</i> sp.)	Edible
Horn or deer antler	Tkach tx'iej	<i>Ramaria botrytis</i>		M	Pine leaves	Edible
Blue mushroom	X'ew	<i>Lactarius indigo</i>	March to April	M	soil, pine leaves	Edible
Cattle belly	Tg'u'j wax	<i>Suillus tomentosus</i>	August	M	Chicharro tree (<i>Platymiscium dimorphandrum</i>)	Edible
_____	Tzū	<i>Amanita muscaria</i>	May to August	M	Cow manure	Poisonous
Black mushroom	X'ewj, Tx'yolorX'oil	<i>Helvella lacunosa</i>	August	M	Pine root, below pine trees	Edible
Coyote	X'o'j	<i>Boletus edulis</i>	June	M	soil	Edible
Dead eye(mature)	Wutz anim	<i>Lycoperdum umbrinum</i>	June to September	S	In the plain	Edible and medicinal
Ear	Xan cuch'	<i>Auricularia delicata</i>	July to September	S	In the plain	Edible
_____	Tx'elok'	<i>Coprinus</i> sp.	_____	S	Alis trunk (<i>Alnus</i> sp.) and elder (<i>Sambucus</i> sp.)	Edible

Note: **for substrates labeled with two asterisks, no scientific name was found.

* saprophytes (S) y Mycorrhizal (M)

blue stain *Lactarius indigo*), for reasons attributable to the detrimental changes, which have taken place in recent years in the Reserve; the most important being: the presence of humans and animal grazing, burning and indiscriminate felling of trees. *Coprinus* sp. was another species that was not observed, however the respondents describe it as: brown, umbrella shape with black lamella, and when broken up turn to black like chicken droppings, as typically described for the genus [20].

Among the commonest genera found stand out: *Amanita*, *Lycoperdon*, *Helvella*, *Boletus*, *Schizophyllum* and *Suillus*. Less common genera include: *Lactarius*, *Auricularia*, *Lepiota*, *Agaricus*, *Geastrum*, *Cantharellus*, *Ramaria*; sporadic: *Sparassis*. The peak month for collection was June, when there is a vast diversity and abundance of mushrooms, especially in the higher parts of the Reserve. Some of the fungi identified in this study have previously been reported by Perez-Ibarra [19]; furthermore, their names in other languages and use by other ethnic groups have been reported by Guzman [40].

Morphology

The Mam respondents associate the term “mushroom” with fruiting bodies of the agaricoid type (e.g. *Amanita*). When other fungi such as the boletoid type are mentioned it is common to designate them as “coyote” and the coraloid type as “deer horn,” even though they all belong to the Fungi Kingdom. This is also the case regarding **Xch’ kbi lak’** (*Agaricus sylvaticus*), a fungus without translation but considered as one of the most important and most represented fungi by this ethnic group.

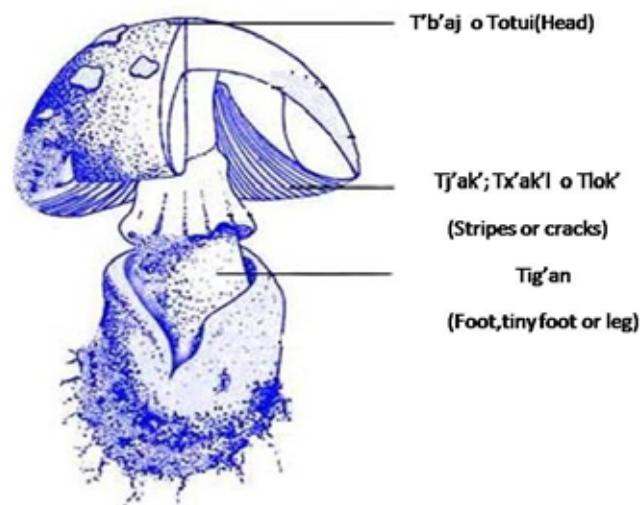


Figure 2. Name of each part of a mushroom recognized by speakers of the Mam language

Respondents were able to recognize and name the different structures of a typical basidiocarp, such as the pileus, the hymenium and stipe; with the exception of ascomycota; unlike the Tzotzil ethnic group who only have knowledge based on the rhizomorphic mycelium or fruiting body, which they called “kaalzamte” or “root” [41]. The names used for each structure are shown in Figure 2.

The names used to refer to each of the structures comprising a basidiocarp is evidence that the people of this ethnic group have acquired a substantial amount of knowledge relating to the following fungi genera: *Lactarius*, *Pleurotus*, *Agaricus*, *Cantharellus*, *Coprinus* and *Amanita*; unlike other species and genera, where these structures are not recognized. Moreover, the meanings of the fungi parts in English (pileus =head; hymenium=scratches or cracks and stipe=foot) which

are given to the same structures of this phylum (Basidiomycota) are consistent with the names given to these parts in the Mam language [1, 22, 42].

Phenology

Fruiting occurs from March to November (according to respondents). During the last two months of this period (October-November), the diversity and abundance of these organisms is considerable lower. The specimens were initially collected from May to September. Based on their mode of existence, 11 species are mycorrhizal and 5 saprophytic (Table 1).

Some fungi show specificity towards a host plant (for example *Suillus* with *Pinus*), others are associated according to the age and successional stage of the plant or wood, such as *Laccaria* with young plants; *Boletus* and *Lactarius* with adult plants (Table 1: substrate) [43].

However, most of the mushrooms, *Lactarius* sp., *Morchella* sp., *Sparassis crispa*, *Agaricus sylvaticus*, *Macrolepiota procera*, *Cantharellus cibarius*, *Ramaria botrytis*, *Suillus tomentosus*, *Helvella lacunosa*, *Boletus edulis*(representative

for the community mam), appear to be restricted to the volcano summit. The distribution of other fungi species is not completely defined, and they may be associated with more than one types of climate. Examples of this include the species *Amanitamuscaria*, *Cantharellus cibarius*, *Lactarius indigo* among others. Other fungi known to the ethnic group vary in their distribution and were found in areas ranging from temperate to warm where it is common to find saprophytic species such as *Pleurotus* sp., *Schizophyllum commune* and *Auricularia delicata* as reported by Bran *et al.* [44].

Ecology

The Mam indigenous inhabitants are able to differentiate several species of mushrooms. 16 were identified in this study, the majority of them edible. The identification of these fungi is based on color, size, shape, texture, time of development and growth type of fruiting body, features that traditional taxonomy also take into account when discerning species.

Trying to identify particular mushrooms can be challenging and confusing; however, the Mam identify them through their ecology; examples being the red mushroom = Tx' iag' tapor Jak' tap (*Lactarius* sp.) usually found on tree "chicharro" and other species that are found at specific sites or substrates. Most respondents commented that the fungi they recognize are found on the upper parts of the volcano. Each of these species may be found in different substrates (Table 1). Some studies provide ecological data for each of the mushrooms (from the time of year they can be found to the type of substrate on which they grow) matched with data provided by the studied community [1, 15, 20, 34, 44].

Criteria used by the Mam ethnic group for traditional classification of mushrooms in the Volcano Tacaná Biosphere Reserve

The Mam respondents identified mushrooms by their morphological characteristics; specifically consistency, with all the above mentioned species categorized as fleshy with the exception of *Auricularia delicata* included within the gelatinous category. Therefore, they do not recognize the ordering criteria mentioned by Mapes *et al.* [42] where by the classification of fungi, has varied according to morphology, phenology and even ecology.

The Mam respondents also classify fungi, according to whether they grow on soil or on "trunks" thus referring to the type of substrate on which they are found. This type of classification is consistent with that observed by several authors [39, 45, 46] who separate diverse groups of fungi populations according to the type of substrate (terrestrial fungi and fungi growing on wood), since the substrates present properties that result in important differences between both groups.

Brief grammatical comparison of vernacular names used by the Mam ethnic group in the Tacaná Volcano Biosphere Reserve and in Guatemala

The work of Arzu-Flores *et al.* [43] describes names in Mam of the mushrooms used for food in some parts of the Sierra of Guatemala and their translation into Spanish. The grammar is very similar to that presented by this ethnic group in Chiapas; but it is interesting to appreciate the meanings given to known mushrooms in Guatemala because most of them do not match those provided by members of the community under study, except one: *Ramaria* sp., known by both communities belonging to the same ethnic group, as "deer horn", *Xew* is a Mam name provided by both communities, but which refers to different species on both the Mexican and Guatemalan side; *X'ulmay* indicate the same species, but the meaning may vary.

We tried to understand the meaning of each mushroom name obtained by comparing the names in the existing Carreño's Mam vocabulary [7]; for example for the term *Tkach/tx'iej*, no similarities were found between the words provided by the group in our study and in this vocabulary. Probably the described term does not belong to the dialect type existing in the study area. However, data is consistent with the prevailing criteria used by the Mam ethnic group for the nomenclature of fungi, principally animal forms, associated plants or habitats, or mushroom colour.

Hosting *et al.* [47] do not specify the names of various fungi found in communities of Guatemala; however, the presence of *Boletus edulis* (Tpanku'k squirrel's bread), *Amanita caesarea* (Q'antzu), *Amanita muscaria* (Xq'antzu), *Ramaria* sp. (Tuk'a Misat) and *Agrocybe aegerita* (TTx'yolil B'aqman) is confirmed and the authors note that the edible mushrooms *Lactarius indigo* and *L. deliciosus* do not present any names in Mam.

Many of the names provided by the Mam community, when translated into Spanish, are related with the morphological characteristics of mushrooms, such as “red mushroom” *Tx’iag’tap* named after its orange color and medium size, as well as appearing fleshier than individuals of the same or other species, but less developed. The “cob mushroom” *B’aj lag’* because the shape is similar to a corncob. Another example is *Xch’kbilak’* (*Agaricus sylvaticus*), that does not describe any particular features of the mushroom so the use of the name has gradually declined over the generations (in the Mam ethnic group) and has no translation. In the case of *Tzü* (*Amanita muscaria*), the essential feature is its striking red color, but it does not have connection with the name in Mam.

The Mam names of some mushrooms are connected to their meaning in Spanish, and some others present similar phonetics, *Tkach Tx’iej* = horn or deer horn, projecting the sound “tkach’ related to Spanish word “cacho” (horn). Chacón and Guzman [48] mention that several species of *Auricularia* (including *Auricularia delicata*) are known to the inhabitants of the Lacandon community as “chole”, “ears” or “gummy ear” but may also have other common names such as “coolosh”, “tzaan” in Tzeltal [40,41].

Regarding nomenclature, the data provided by respondents is in keeping with Berlin’s statement (49), that ethnobiological nomenclature usually refers to morphological features associated with its biological referent.

Uses of mushrooms

The Mam community uses most of their known mushrooms for food, although some are used in traditional medicine. Meso-American Indians also used mushrooms for their medicinal properties, an example being moldy tortilla as containing various species of *Penicillium* (50) used to heal skin wounds.

There are mushrooms that are used for food and medicinal purposes, such as *Lycoperdon umbrinum* (in Mam = *Wutz anim*) “dead’s eye” with similar applications as those reported for *Geastrum saccatum* (“soil star” in central Mexico, or ichlo-um, lol-lum, pupulik, pupush-lu-um, sorta-ojo, xpupul-ikil, in the Yucatan peninsula) (40, 41, 51). Besides being used against the evil eye, boiled alone or with other plants and infusions, it is also used as a powder combined with other plants against asthma and to dry the navel of newborn babies.

In Chiapas, in addition to *Lycoperdon umbrinum*, there are other species such as *Bovista fusca*, *Calvatia cyathiformis*, *C. gigantea*, *Lycoperdon candidum*, *L. perlatum*, *L. pyriforme*, *Vascellum termedium* and *V. pratense*, that are considered as edible and have medicinal uses when young (“when they are white”), such as coagulating blood and healing wounds, by directly applying the spores (“the powder”). These mushrooms are known by the name “bujtél”, “bursting ball”, “balls”, “baby calves” and “little eggs” in other regions [15, 41, 43, 50].

The mushroom *X’ew* (*Lactarius indigo*) is used as a food both among the Mam and in the region of Acambay, Mexico. It has also been recorded as medicinal, as a purgative; however, its use in folk medicine is restricted [51, 52].

The majority of these mushrooms have been reported in coniferous forest, followed in order of importance by: oak forest, cloud forest, tropical forests, and agricultural and urban areas [53,54]; although Guzman [55] and Moreno-Fuentes *et al.* [56] indicate that most of the fungal biodiversity is found in tropical regions. Since many ethnomycological studies have been conducted in temperate areas, there is a lack of available data in tropical areas.

Boletus edulis (in Mam = *Xo’j*; English = coyote) is one of the fleshy fungi consumed by the Mam community, but it is also scarce and hard to find. There are records indicating that this fungus is edible and common in the Maya region with common names such as “zek um tulle” in Tzotzil [50,51].

Amanita muscaria (in Mam = *Tzü*, without translation to English) is known to be poisonous and is used as livestock feed, although there is no record of the latter use. It is a sacred mushroom in Latin America, as well as having important ethnomycological roots in Meso-america and possible ceremonial use among Mayans who identify *A. muscaria* as the “mushroom of Thunder”, “mushroom Ray” or “weed Thunder” [40, 50, 51, 57]. In other parts of the world this species is also known as poisonous, medicinal or as an insecticide [58, 59].

Schizophyllum commune (in Mam= *X' itx' k' ku' ku*) also known in other regions of Chiapas as “sulte” (wooden peel), is very popular and sold in the markets of Guatemala and is identified by the name of “asam”. The studied community considered *S. commune* as edible and was one of the most frequently observed fungi in the study. It is one of the most consumed and is known in various parts of the country and the world [15, 34,39]. This species is also reported in traditional Chinese medicine, used against leucorrhoea [60].

Auricularia delicata (Mam = *xancuch'*) recognized as edible in both the Mam and Lacandon communities [15]. Yinget al. [60] refer to several species of the genus *Auricularia* in the Chinese pharmacopoeia as medicine for the stomach and body, improving blood circulation and preventing bleeding.

The Mam informants are not aware of the existence of a fungus with recreational use (as a toy); however, in the town of Teapa (Tabasco) people recognized the genus *Auricularia* as having this use [39]. The Mam informants considered Tx'elok' (*Coprinus* sp.) edible, although Guzman [61] reported no practical properties for this mushroom.

The use of species found in the Mam community during this study was distributed as follows: 14 edible, one medicinal and one without use but recognized as poisonous.

These results concerning Mam autochthonous knowledge on species of fungi are similar to those found by Hostinger et al. [48] in several Mam municipalities in Quetzaltenango, Guatemala. In a study conducted between 1994 and 1998; the authors mention that most of the farmers in the study areas recognized about six mushrooms by name at most and twelve as edible, inedible or poisonous.

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