 doi:10.20944/preprints201807.0190.v1

Management of wild edible fungi in the *Meseta Purépecha*, Mexico

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Abstract

Mexico is an exceptional setting for ethnomycology since human cultures have interacted with fungi for thousands of years; the state of Michoacán is particularly important since nearly 11% of the fungi species recorded in Mexico occur there, 139 species being edible. This study aimed to analyze the taxonomic diversity and use forms of fungi, their position in worldview of people, and the management forms practiced on edible fungi in the *Purépecha* communities of *Cherán* and *Pichátaro* and the environmental problems in relationship with fungi management. We

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conducted semi-structured interviews during visits to regional markets, participant observations in harvesting areas, workshops, and presentation of results to the communities and communal authorities. We recorded ethnoecological information for 21 edible fungi species. The words *jongo* and *terekua* correspond to useful fungi in *Purépecha*, while *jeramba* refers to not edible fungi. In Cherán people identify different vegetation types where mushrooms occur; they recognize the "pinadas forest" dominated by *Pinus leiophylla*, "encineras" (dominated by *Quercus crassipes*), "*tepamu* forest" (dominated by *Alnus acuminata*), "*sharhari* forest" (*Quercus* aff. *laeta*), and grasslands, all of them sites where mushrooms grow. Fungi handlers identified environmental problems like land use changes, illegal extraction of forest resources, deforestation, unplanned urban growth, uncontrolled fires, livestock raising, and agricultural intensification, which affect fungi communities. In turn, these factors have secondary consequences like soil erosion, reduction of native vegetation and reduction of rainwater retention that directly disturb diversity, distribution, and abundance of fungi. Information from this study and workshops conducted with the community helped to design strategies for conservation of both forests and fungi.

Keywords: Ethnoecology, ethnomycology, San Francisco *Cherán*, *Michoacán*, *Purépecha*, KCP complex.

Introduction

Mexico has exceptional high biological and human cultural diversities, and both types of diversities have interacted for more than 12,000 of years (MacNeish, 1992). It is one of the five mega-diverse countries of the World (Toledo and Barrera-Bassols 2008). This fact offers an opportunity for studying an exceptional setting of interactions and interrelations between societies and ecosystems, the main components of biocultural diversity (Toledo and Barrera-

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Bassols 2008). Among scientific disciplines interested in the study of the relations between nature and society, cultures, and environments, ethnoecology is one of the most outstanding. It aspires to assess from holistic and multidisciplinary perspectives the relationships between *kosmos* (beliefs and symbolic representations of reality), *corpus* (environmental knowledge), and *praxis* (strategies for managing and appropriating nature) constructed by peoples and biocultural diversity (Toledo and Alarcon-Chaires 2015). Ethnomycology is an area that has analyzed the interactions between peoples and fungi and we consider pertinent and necessary conducting ethnomycological studies from the conceptual framework of ethnoecology.

Poverty, food insecurity, environmental degradation and biodiversity and biocultural diversity loss in Mexico are relevant problems (Moreno-Calles *et al*., 2016). Ethnobiology in its fifth phase should contribute to solve the problems related to contemporary environmental and cultural crises (Wolverton, 2013). Studies of ethnoecology, ethnobiology or ethnomycology are important to solve food insecurity, environmental degradation and biodiversity and the loss of biocultural diversity in this country.

Biocultural diversity associated to fungi is highly important in Mexico. Guzmán (1998a, 1998b) estimated for this country the occurrence of about 6,710 species, 2800 macromycetes, 300 of them edible (Garibay-Orijel *et al*., 2006). Fungi are considered to have high ecological, cultural, and economic importance for rural communities, since peoples include a broad spectrum of mushrooms in their diet. In addition, from their commercialization people obtain incomes, commonly the most important source of monetary incomes for households. Numerous ethnomycological studies have been carried out in Mexico since the Colonial period to understand the relationship between Mesoamerican societies and fungi, outstandingly Sahagún (1530), Wasson and Wasson (1957), Estrada-Torres *et al.* (1987), Guzmán (1994); Mapes et al.

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(2002). However, studies on ceremonial or ritual uses are more common than investigations on food and medicinal uses, and even scarcer are studies on management forms of fungi (Vásquez-Dávila 2007).

Markets of indigenous peoples in Mexico are extraordinary sites for documenting forms of use and preparation of fungi and other non-timber forest products, their cultural and economic importance, and for general evaluations of local knowledge about forest resources, including mushrooms (Ruan-Soto et al. 2004; Sánchez et al. 2010). The collection of fungi for direct provision of food, and for generating monetary incomes allow maintaining alive traditional knowledge on these resources in numerous households and communities. Markets and interchange contribute to remain use and management of mushrooms as living processes throughout Mexico, despite strong processes of acculturation (Vásquez-Zárate, 2007). However, not all Mexican cultures consume fungi. Several studies have identified that although most Mesoamerican cultures are mycophyilic, some others are mycophobic, which do not consume fungi since these are considered harmful (Ruan-Soto et al. 2013).

Mycological studies in the state of Michoacán have recorded 74 families, 652 species and 18 infra-specific taxa of fungi (Gómez-Peralta and Gómez-Reyes 2005). Ethnomycological studies of Michoacán have been carried out mainly in the Monarch Butterfly Biosphere Reserve, the *Pátzcuaro* Lake basin, the *Tancítaro* volcano and neighboring mountains, and *Tacámbaro* and the surrounding areas of the city of Morelia (Mapes et al. 1981; Gómez-Reyes et al. 2005; Farfán-Heredia *et al.* 2007; Farfán-Heredia 2011; Cruz 2009; Díaz-Barriga 1992; Díaz-Barriga 2003; Gómez-Peralta *et al.* 2007). The studies have mainly focused to document fungi taxonomy, ecology, and mycological use by local people (Carlos-Santos 2016; Torres-Gómez et al. 2017). In total, 139 of the species recorded are edible, 38 are poisonous, seven have medicinal use, 152

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establish symbiotic association with forest species (mycorrhizae), and 13 have hallucinogenic properties (Gómez-Peralta and Gómez-Reyes 2005).

In the *Meseta Purépecha* (*Purépecha* Plateau) region, 43 communities have climatic and biophysical aspects that allow the presence of fungi in their territories; however, the studies conducted in that region are still scarce. Researches have been carried out in the communities of *Arantepacua*, *Sevina*, and *Carapan* (Torres-Gómez 2008; García-Chávez and Chávez -Ramírez 2015; Carlos-Santos 2016). In these communities, processes of cultural change, illegal extraction, and over-exploitation of forest, as well as land-use change associated to expansion of agriculture, livestock, and urban settlements have drastically affected the traditional management practices of NTFP and fungi. In addition, climate change is a major problem determining general biodiversity decline (SEMARNAT 2013). Considering all these factors, we consider relevant studying the worldview of local peoples and the place of fungi in it, the knowledge people have about their environment, and the management techniques they have developed for facing the conservation of ecosystems and fungi.

San Francisco *Cherán*, a community from the *Purépecha* Plateau region, is dominated by pine and oak forests with considerably high mycological and ethnomycological richness previously undocumented. Nearly 97% of people are *Purépecha*, but only 25% speak this language, known as *P'urhe* (INEGI, 2004). Our study aimed to analyze the mycological richness, traditional knowledge, use, and management techniques, the main problems people perceive for conserving forests and resources, and the solutions they and academic allies consider pertinent for ensuring their permanence. We look for linking ethnomycology with ethnoecological perspectives and contributing to organize information useful for local decision-making for sustainable use and conservation.

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Study Area

The *Purépecha* Plateau is in the central-western region of the state of Michoacán, in the Transversal Volcanic Belt of Mexico. It is formed by 43 indigenous communities of 11 municipalities, *Cherán*, *Carapan*, *Nahuatzen* and *Paracho* are the municipalities with the highest proportion of *Purépecha* people in the region (Ávila, 2007). The market of *Paracho* is in a transitional zone between the Pátzcuaro Lake region and the *Purépecha* Plateau, and every Sunday people interchange mushrooms there from May to September, when people collect, consume, and/or interchange them.

San Francisco *Cherán* has a territory of 221.88 km^2 extent; it is located at elevations between 2,200 and 3,200 m, with temperate climate and annual rainfall averaging 1,100 mm. Nearly 32.9% of its territory is dedicated to agriculture, the forests representing 62.01%, grasslands 2.38%, and the urban area 2.45% (INEGI 2009). Forests are predominantly pine, oak, and a small portion of *oyamel* fir (*Abies religiosa*) forests. In addition, there are some remains of subtropical scrub, predominantly composed by *huizaches* (*Acacia* spp.) and *mezquites* (*Prosopis* spp.).

Among the main studies about edible wild mushroom species in the *Purépecha* region, those by Mapes and Caballero (1981), Díaz-Barriga (1992), Gómez-Reyes (1992), León-Jaimes (2007), Torres-Gómez (2008), Zamora-Equihua (2006), Carlos-Santos (2014), Gómez-Reyes (2015), García-Chávez and Chávez-Ramírez (2015) can be mentioned. These studies show the high fungi richness and the need to conduct more extensive ethnomycological studies in the area (Table 1)

Methods

Qualitative analyses

 doi:10.20944/preprints201807.0190.v1

This work was conducted in two steps. During May to September (the fungi production season), of the year 2014, every weekend we carried out visits and interviews to people selling and buying mushrooms in the market of *Paracho*. Then, from July to September of 2014 and from May to September of 2015 we carried out our study in the market and the community of San Francisco *Cherán*. Before conducting interviews, we designed a preliminary questionnaire, which was then used for formal interviews. In the market of *Paracho* we carried out 18 interviews, documenting the communities commercializing wild mushrooms in the region, processes of interchange, use and management of these forest products. We particularly recorded the number of sellers of mushrooms of a community, the richness of edible wild mushrooms sold, and the vegetation types where mushrooms were collected. That study identified San Francisco *Cherán* as a representative community for deeper further studies.

San Francisco *Cherán* is governed by traditional authorities, and the *Concejo de Bienes Comunales* (Communal Property Council), and we asked permission to these authorities to carry out our study. For selecting interviewees, we followed the "snowball method", through which an informant or group of key informants lead to other individuals with relevant information to the study (Taylor and Bogdan 1987; Fuentelsaz 2004). We also requested permission to the interviewees for recording and when they agreed, we recorded the interviews for further analysis. We conducted 18 interviews and guided tours with mushroom specialists (*hongueros*) to the places of fungi collecting. In addition, we conducted a workshop with *hongueros*, by showing to them photographs of different mushroom species as stimuli of brainstorming about problems they face in relation to availability of these resources and possible solutions. In the workshop we also emphasized questions on extraction techniques and management of edible fungi, and people's

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perception on their ecological and economic importance, use and management, and their relation with the agro-festive calendar (PRATEC, 2006).

Collection, preservation, and identification of fungi specimens

Mushroom specimens obtained in the markets of *Paracho* and *Cherán*, as well as those collected in the field were photographed and used as support for further identification. For mushroom collecting and preliminary identification, we followed the techniques by Cifuentes et al. (1994), and Frutis-Molina and Huidobro-Salas (2013). For each specimen, we tagged some aspects relevant for their identification. The identification of species was firstly at macroscopic level; then, we used the taxonomic keys by Guzmán (1990) to corroborate their identity, we also complemented this task following the illustrated guides by McKnight et al. (1987), Díaz-Barriga (1992, 2003), Reyes-García et al. (2010), Laessoe et al. (2010) and Farfán-Heredia (2011). The MycoBank database http://www.mycobank.org/ was used to standardize a system of nomenclature and classification. With this information we prepared technical files of each species recorded with the support of M.C. Víctor Manuel Gómez-Reyes from the Universidad Michoacana de San Nicólas de Hidalgo. Subsequently, we followed the preservation methods proposed by Cifuentes et al. (1994). For the correct writing of the *Purépecha* names we had the valuable support of a specialist in *Purépecha* language.

Feedback from the community of *Cherán*

The results of the research were showed in a technical report to the Communal Property Council and through a presentation to people of the community in the Second Colloquium, *Juje Cherani amperi uantaxeni* (Let's talk about *Cherán*) organized by the community for the presentation of results from all researches about *Cherán*.

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Results and Discussion

Municipal market of *Paracho*

People of the communities of *Cheranástico*, San Francisco *Pichátaro*, San Benito Palermo and San Francisco *Cherán* regularly go to the market of *Paracho* for selling edible wild mushrooms. *Cherán* was the community with the largest number of mushroom sellers, representing 56% of all mushrooms merchants. In the market, the main species traded were *Lyophyllum descastes*, *L. loricatum* (*pashakuas* or *uáchikuas*), *Helvella crispa* and *H. lacunosa* (mouse ears), *Hypomyces lactifluorum* (pork trunk), *Ramaria flava* and *R. rubiginosa* (bird's feet). This information complemented the inventory reported by Torres-Gómez (2008).

Selling in markets is mostly carried out by women (80%) who, together with mushrooms, sell other products from gathering (medicinal plants, fruits and other traditional greens and vegetables harvested from homegardens). Most (70%) interviewees were 47 to 57 years old, and it is notorious that participation of younger people (between 14 and 35 years old) in the market has declined, since they decided to migrate abroad.

People interviewed in the market of *Paracho*, mentioned that women perform commercialization of mushroom, since they also sell other products prepared by them (embroidered garments, conserves, and bread) or harvested by their households (those mentioned above). Men of all households interviewed harvest mushrooms; the journeys to the collecting areas may take one to three hours walking. Participation of young people in mushroom gathering has also declined since they migrate. This aspect and the uncontrolled fires in forest ecosystems are the main reasons considered by local people for explaining the mushroom gathering and commercialization depletion.

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Mushrooms ethnoecology in *Cherán*

Corpus

Terekua, *jongo* and *jeramba*

In this community, the words *jongo* (a term derived from the Spanish word *hongo*) and *terekua* (singular) and *terekuicha* (plural) for naming all mushrooms in general, and people use the epithet *jeramba* to refer not edible fungi. In the communities of the *Pátzcuaro* Lake shoreline, the *Purépecha* people consider mushrooms as things of the world apart from plants and animals (Mapes 1981). Gómez-Reyes (2015) mentions that several communities of the *Purépecha* Plateau assign the generic name of *terekua*, which refer to the formation of the root of the forest or soil. In *Cherán*, toxic mushrooms are called *jeramba terekua* or *simply jeramba*. The word has the same root as *jerachi* o *erachi* which means 'brother', adding the suffix *-emba* which means the possession of the third person, both meaning 'her (or his) brother' (Diccionario Grande, XVI or XVII Centuries). According to Mapes *et al.* (1981), this term means that mushrooms are "bad" (not useful or poisonous). In other *Purépecha* dictionary, the term *jeramba* means "wild" (Velásquez-Gallardo, 1978). In the community of *Sevina* people do not use the term *jeramba* (García-Chávez and Chávez-Ramírez, 2015).

Purépecha nomenclature of edible fungi, species richness and preferences

This study identified 21 species, 15 of them edible and 6 poisonous (Table 2). Compared with other studies in the region, we recorded a relatively low number of species and *Purépecha* names. For instance, Mapes et al. (1981) registered 43 edible species of fungi and 53 *Purépecha* names in the *Pátzcuaro* Lake region. However, compared with other communities of the *Purépecha* Plateau the number of species recorded is relatively high. For instance, García-Chávez and

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Chávez-Ramírez (2015) and Carlos-Santos (2016) found in *Arantepacua* and *Carapan* 16 and 14 species, respectively. Such differences are maybe due to the greater extent of forests in the territory of *Cherán* and by the efforts in the social organization for defending and protecting the forest.

We recorded six poisonous species of mushrooms in *Cherán*, but three of them (*Gymnopus dryophilus*, *Helvella lacunosa*, *Russula brevipes*) are edible in other communities of the *Purépecha* Plateau, like *Arantapecua*, *Sevina* and *Carapan* (Torres-Gómez, 2008; García-Chávez and Chávez-Ramírez, 2015; Carlos-Santos, 2016). The case of *Cantharellus cibarius* is controversial, since one family consume this species in *Cherán* and other communities of the *Purépecha* Plateau, but people of *Cherán* in general consider it poisonous. Maybe, the origin of this controversy is that *Cantharellus cibarius* resembles *Russula brevipes,* a species considered poisonous in this community, but has the color of *tiámu terekua* or the pork trunk edible mushroom (*Hypomyces lactifluorum*). *Amanita muscaria* and *A. virosa* are poisonous.

For people of *Cherán*, the most valuable species because of their abundance and good flavor, and which therefore are the most popularly commercialized are *tiámu terekua* (*Hypomyces lactifluorum*), *tiripiti terekua* (*Amanita caesarea*), *kuinit jantsiri terekua* (*Ramaria* spp.). *Uáshikuas* or *pashakuas* (*Lyophyllum loricatum* and *L. decastes*), which are highly appreciated for being very abundant, but their flavor is not as good as that of the species referred to above, and their price is lower (nearly 1 US dollar per kg). In contrast, *Hypomyces lactifluorum* is less abundant, and the most prized of all species, reaching between 4 to 5 US dollars per kg. Table 3 shows the preferences by flavor and incomes of edible wild fungi species. Some species are used for the direct consumption by households that collect them, since they are very scarce or are little

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known; these are the cases of *Boletus* aff. *edulis*, *Cantharellus cibarius*, *Clitocybe gibba* and *Lycoperdon perlatum*.

Ecological knowledge

In *Cherán*, knowledge is orally transmitted from parents to children; therefore, grandparents and parents are very important actors for the identification of edible and poisonous species and to teach the children how to identify them. As in other communities in the *Purépecha* Plateau (Torres-Gómez, 2008), people identify mushrooms based on their texture, color, smell, and the place where the mushrooms occur. In addition, they use the dual fungus called *jeramba* to know that the groceries are about to leave, are also based on the amount of rainfall and all these signs are considered to decide whether going to collect mushrooms.

Mushrooms are highly important for people of *Cherán* during the rainy season, when the extraction of pine resin decreases, and people find in mushrooms an alternative option to obtain monetary incomes and food. In addition, they recognize that trees and vegetation are necessary for the development of fungi. Therefore, they know the importance of maintaining high amounts of trees in their territory. They also consider that depending on the type of vegetation and the relief of the terrain they will find fungi. People of *Cherán* related vegetation type with mushrooms types, they identify the "*pinadas*" (sets of young pines, mainly of *Pinus* aff. *leiophylla*), *encineras* (*Quercus crassipes*), the "*tepamu* (*Alnus* aff. *acuminata*) forest", *sharari* forest (*Quercus* aff. *laeta*) and grasslands as main sources of the different types of mushrooms (Table 4).

The season of maize cultivation and the fungi harvesting is an activity indispensable for *hongueros* in the *Purépecha* Plateau. This activity takes place between the dry season and the

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rainy season, which starts in April and ends between August to October, sometimes maize harvesting is delayed, and mouse ears mushrooms are obtained until November and December. There is also maize cultivation by irrigation, but it covers only a low area (Figure 4). The more abundant mushroom species in June are *Lyophyllum decastes* and *L. loricatum*. The months of July and August are the richest in mushroom species, then people find *Hypomyces lactifluorum* and *Ramaria* spp. predominating, *Amanita caesarea* in fewer numbers; and eventually *Lyophyllum decastes* and *L. loricatum* are still present. Finally, *Helvella crispa* and *H. lacunosa* grow at the end of August and throughout September. According to people interviewed, there may be pigs' trunks until November; however, these mushrooms are only directly consumed by households that collect them, not commercialized. Maize cultivation begins in May, whereas the dry season begins in November, when the collection of dry wood and extraction of pine resin increase. By that time, the making of embroidered garments increases, for the holidays of November, December, and January. A ritual to the protective beings of the forest is carried out by that time, which is very important in the worldview of this community.

Praxis: Ecological knowledge, management and harvesting techniques

Fungi management and harvesting techniques

Harvesting techniques vary among the species collected. Most of the collectors only extract the larger and “open” individuals (mature fructiferous bodies or carpophores) and give to them slight blowing in the hat, in order to “enhance shooting the mushroom seeds (spores)”. The small mushrooms are left in the forest for continuing growing and remain until the next year. This is because the collection areas are increasingly distant from the villages, due to illegal logging and change of land use; people walk nine hours. The Figure 5 shows the different ways of extracting from the most commercialized species.

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These techniques are like those recorded in the market of *Parácho* except the *tiripiti terekua* or yellow (*Amanita caesarea*), whose "hat" (cap) is collected by people while leaving the "paw" (stipites) together with the "egg" (volva) so that it leaves again. Some people only leave the egg. *Neolentinus* sp. called *iarini terekua*, fungus of *iarín* or *iarini terekua* because it grows on the *iarín* (dura matter) of the stumps dead and rotten of the pines. This technique consists of cutting a part of the stipites, leaving two fingers of this in the trunk so that this one returns to leave the following year. Finally, the community considers the yok of oxen are “shy mushroom” because if it is seen, it does not grow, that is why the *hongueros* avoid the places where it grows like in the rotten trunks that are in very humid zones in the months from June to August and they are harvested the next year. We did not find records of this management and harvesting knowledge in the *Purépecha* Plateau. The basic activity of gathering mushrooms is from June to August, together with the collection of medicinal plants. The collection of dry wood remains a long the year, although, in the time of raining is reduced (this activity needs special permission given by the Communal Property Council, if this permission is not available the person or persons may be sanctioned).

***Kosmos Purépecha* and the relationship with the forest**

For the community of *Cherán*, the forest is a resource of great spiritual, social, cultural, and economic importance. People believe in the existence of guardian spirits of the forest, these benefic beings can provide food or may deny it, depending on the use given to the forest. "La Miringua”, is an example of these guardians, this spirit confuses people who want to harm the forest or are in a state of drunkenness and who lose in the forest for days (Garrido-Izaguirre, 2016). In reforestation programs, before carrying out a ceremony, this ritual activity has the

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purpose of deceasing risk for the participants and favoring nature to reconstructing. In addition, it is a sign of respect and recognition of their sacred entities (Velázquez-Guerrero, 2013).

Problems and possible solutions in the fungi management and consumption

People of *Cherán* and other communities of the *Purépecha* Plateau have faced diverse problems in the protection of their natural resources. In addition to social conflicts, other problems have been identified that affect traditional forest activities. Garibay-Orozco and Bocco-Verdinelli (2011) conducted a study on land use change in the plateau in 1956, 2000 and 2005. These authors mention that cultivation of avocado is the main reason of such land use change. Since the municipality of *Cherán* is settled in highlands with low temperatures, this aspect limits the expansion of that crop; however, the forest area is affectation mainly by the illegal extraction of forest resources and of the unplanned urban growth. In addition, although to a lesser extent, agriculture, livestock, and uncontrolled fires. All these are factors influencing massive deforestation, which in turn has secondary consequences such as soil erosion, reduction of native vegetation and reduction of rainwater retention that directly disturbs diversity and fungal abundance.

In this context, the activity of harvesting and commercializing fungi is affected; it requires more time, dedication, and effort to move, as well as a special knowledge to correctly identify the toxic and edible species. The number of people specialized in carrying out mushroom collecting has decreased, mainly since young people have little interest in carrying out field activities and prefer to carry out other activities, such as work outside the municipality and even abroad (León-Jaimes, 2007; Torres-Gómez, 2008).

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People consider that fires affect survival of mushroom seeds (spores), which may reduce their abundance and encourage the development of species not suitable for consumption. In addition, fires favor the growth of weeds that exclude the development of some mushroom and pine species. In this context, Fernández de Ana Magán (2000) mentioned that according to the intensity of the fire may affected fungal communities: saprophyte fungi located in the surface of the soil or mycorrhizal communities that are in the radical tissues of the most superficial trees of the soil. This intensity of fires may be due to various factors such as soil moisture, the amount of dry organic matter and its caloric capacity, site topography, temperate, and wind speed.

However, there is research that shows that some fungus species may benefit from fire. For instance, Gómez-Reyes et al. (2014) found in the Barranca of *Cupatitzio*, Uruapan that fires can promote the development of exclusive species in burned sites that could be in latency, which are activated and germinate by the elevation of temperature. This fact therefore favors a modification in the composition and even depending on how constant and intense the fires can very different from the composition before disturbance in temperate forests.

Similarly, people of this community identify as a major problem, the behavior of erratic rains out of time they expect them, which is attributed to the decline of the surface of the forests and global climate change. Despite the problems that are faced, some solutions have been carried out, such as reforestation. They consider that to include young people who have some knowledge or interest in fungi in different activities where they can share their experiences with other young people, it is also considered necessary to carry out talks about the importance of the activity and information on the nutritional bases that have the fungi and its ecological importance in ecosystems. This can be carried out by authorities and community dwellers with the collaboration of academic experts. Gastronomic sampling and mycoturism is also a solution provided by

people interviewed. All these are elements for constructing and planning a communitarian strategy for conserving forests and mushrooms availability, continuing and even increasing their use. Experimenting cultivation technique of some species is also possible and all these activities may contribute to maintain resources and customs of fungi consumption by the *Purépecha* people.

Acknowledgments

The authors thank the Concejo de Bienes Comunales, local people (Genoveva Pedroza) and *hongueros* of San Francisco *Cherán*, Michoacán. The authors acknowledge the support in the design of the study, collection, analysis, and interpretation of data and writing the manuscript of the projects DGAPA-UNAM PAPIIT IN200417 and PAPIME PE209517.

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 doi:10.20944/preprints201807.0190.v1

Tables

Table 1. Ethnomicological studies carried out in the *Meseta Purépecha*, *Michoacán*.

Author	Title	Description
Zamora (2006)	Inventario de hongos silvestres comestibles de la comunidad "El Aguacate" Sur del municipio de Tancítaro, Michoacán, México.	Exploration of local mycological knowledge as well as the relation of *Russula brevipes* and *Hypomyces lactifluorum*. They found 16 species of edible wild fungi, describe the common names of the parts of the fungi, the related worldview.
Torres (2008)	Conocimiento y uso popular de macromicetos silvestres en la comunidad de Arantepacua, Municipio de Nahuatzen, Michoacán, México.	Compilation of 27 *Purépecha* names (16 wild fungi species and 11 to the parts of an agarical) and the most popular species, amount of extraction, their culinary value, and their methods of preparation.
Carlos-Santos (2014)	Etnomicología y aspectos ecológicos de los hongos comestibles de San Juan Charapan, Michoacán.	Local ecological knowledge of edible wild fungi, was estimated their diversity, abundance, and productivity in forest areas, as well as the influence of land use change and deforestation on the decline of fungus productivity.
García-Chávez and Chávez-Ramírez (2015)	Guía didáctica para la identificación de hongos silvestres de la comunidad de Sevina, Michoacán.	Local ecological knowledge of edible wild fungi, was estimated their diversity. Fungi distribution in nine types of vegetation: conserved pine, disturbed pine, oak-pine conserved, oak-juvenile pine, *tejocotal* (*Crataegus mexicana* scrub), adult cedar, juvenile pine, adult pine, trunks, *milpa* (Maize, beans, and pumpkins polyculture) and slope.

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Table 2. Scientific, *Purépecha* and local names and edible or poisonous species status, includes additional information by Velásquez (1971), Mapes (1981) and Gilberti (1559) and *Pichátaro* market and San Francisco *Cherán* interviews.

Scientific name	***Purépecha* names or local names**	**Additional information**	**Edible (E) or Poisonous (P)**
Amanita caesarea (Scop.) Pers.	*Tiripiti terekua*, yellow	*Tiripiti* means golden or gold color and *terekua*, mushroom.	E
Amanita muscaria (L) Lam.	Chets, sweetened bread	-	P
Amanita virosa Secr.	White	-	P
Boletus aff *edulis* Bull.	*Panterekua* or *Pan terekua,* the belly, the belly of an ox, the belly of an old woman, bread.	*Pan terekua*: mushroom in the form of bread. From Spanish *pan* 'bread'.	E and medicinal
Cantharellus cibarius Fr.*	Pig horn *jeramba*	*Jeramba*: Like, bad, poisonous, wild	E and P
Clitocybe gibba (Pers.) P.Klum	Small beans		E
Gymnopus dryophilus (Bull.) Murrill*	False small beans	-	P
Neolentinus sp. Redhead & Ginns	*Yarinterekua* or *Iarhini terekua*, *yarin* mushroom, little eagle	*Iarini*: mature pine, *iarini terekua*: variety of edible fungus that grows on old sticks (Velásquez Gallardo, 1978)	E
Helvella crispa Bull.	*Sirat agants* or *siráata angánts terekua* mouse little ears	*Sïrata anha-ntsï terekua*: erect-head smoke or smoke standing on top, variety of edible fungus, is now written *sïrata anhantsï*	E
Helvella lacunose Afzel*	*Sirat agants* o *siráata angánts terekua jeramba*	*Sïrata anha-ntsï terekua jeramba*: erect-head smoke wild mushroom, "not good".	E and P

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Hypomyces lactifluorum (Schwein.) Tul. & C. Tul.	*Tiámu terekua*, horn pig	*Tiámu terekua: Tiámu* 'iron', *terekua* 'mushroom'	E

Scientific name	***Purépecha* names or local names**	**Additional information**	**Edible (E) or Poisonous (P)**
Laccaria laccata (Scop.) Cooke	Small beans	-	E
Lyophyllum loricatum (Fr.) Kühner	*Huashikuas*, *pashakuas*, *huachikuas*	*Paxa-*: division of roads (Diccionario Grande, s. XVI or XVII). *Uáxikuas* or *uáchikuas* are	E
Lyophyllum decastes (Fr.) Singer	*Huashikuas*, *pashakuas*, *huachikuas*	variants of the same word and -s is the plural in Spanish. Mapes *et al*. (1981) appears *uáchitas* 'small cumulus'. For Diccionario Grande, *uacheni* means 'to be many'. Now, the words for 'a lot' are *uá-nekua* and *uá-ni*, which have the root *ua-* 'a lot'. For Delfina Durán, inhabitant of Cherán, means ladies, being always in groups.	E
Lycoperdon perlatum Pers.	Caca de *nana kutsi*. Mother moon poo	*Nana kutsï* means 'Mrs. Moon'	E
Ramaria aff *rubiginosa* Marr & D.E. Stuntz	*Kuinit jantsiri terekua*. Bird´s paw coffee	*Kuinitu jantsiri* means 'little bird's paw'	E
Ramaria flava (Schaeff.) Quél.	*Kuinit jantsiri terekua*. Bird´s paw yellow (sweet smell)	-	E
Ramaria formosa (Pers.) Quél	*Kuinit jantsiri terekua jeramba*. Bird´s paw light yellow	-	P
Ramaria aff *flavigelatinosa* Marr & D.E. Stuntz	*Kuinit jantsiri terekua*. Bird´s paw white	-	E
Russula brevipes Peck.*	Trunk pig *jeramba*	-	P
Sparassis crispa Marr & D.E. Stuntz	Yoke of oxen	-	E

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Table 3. Preferences by flavor and incomes of edible fungi species. Symbology: ☺☺☺☺☺ very tasty, ☺☺☺ tasty, ☺ little tasty; $ $ $ $ $ very well sold, $ $ $ sold, $ little sold

Species	**Preference by flavor**	**Incomes**
Amanita caesarea	☺☺☺☺☺	$$$$$
Boletus aff. *Edulis*	☺☺☺	
Cantarellus cibarius	☺	
Clitocybe gibba	☺	
Neolentinus sp.	☺☺☺☺☺	
Helvella crispa	☺☺☺	$$$
Hypomyces lactifluorum	☺☺☺☺☺	$$$$$
Lyophyllum loricatum	☺☺☺	$$$$$
Lyophyllum descastes	☺☺☺	$$$$$
Lycoperdon perlatum	☺	
Ramaria aff. *rubiginosa*	☺☺☺	$$$
Ramaria flava	☺☺☺	$$$
Ramaria botrytis	☺☺☺	$$$
Ramaria aff. *flavigelatinosa*	☺☺☺	$$$
Sparassis crispa	☺☺☺	$

 doi:10.20944/preprints201807.0190.v1

Table 4. Wild fungi species and vegetation type where developed in according to interviews. This table shows the different vegetation types identified by the inhabitants of *Cherán* where registered species can usually be found. Besides the *hongueros*, they consider some of the type of vegetation, the incidence of light, number of tree species in the area and relief, to know the abundance and presence of fungi.

Wild fungi species	**Vegetation type or habitat**
Amanita muscaria	
Amanita virosa	*Pinadas*
Boletus aff *edulis*	
Cantharellus cibarius	(Set of young pines mainly of *Pinus* aff *leiophylla*)
Clitocybe gibba	
Gymnopus dryophilus	
Laccaria laccata	
Ramaria aff *rubiginosa*	
Ramaria flava	
Ramaria Formosa	
Ramaria aff *flavigelatinosa*	
Russula brevipes	
Sparassis crispa	
Neolentinus sp.	Tree trunk rotten
Helvella crispa	Pineland/ grassland/cedar vegetation
Helvella lacunose	
Hypomyces lactifluorum	*Tepamu* vegetation (*Alnus* aff *acuminata*) or *Pinada*
Lyophyllum loricatum	Holm oaks (*Quercus crassipes*)
Lyophyllum descastes	*Sharari* vegetation (*Quercus* aff *laeta*)

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Lycoperdon perlatum	Oaks and grassland