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The edible mushrooms from small community Tierras Coloradas in Hidalgo, Mexico

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Abstract

In Mexico, there is a rich tradition of mushroom consumption. In the state of Hidalgo, approximately 120 edible species are reported; however, there are few ethnomycological studies in temperate forest regions. The aim of this study was to report the wild edible mushrooms in the small community Tierras Coloradas in Hidalgo, Mexico. Field trips were conducted between 2022 and 2023 during the rainy season in “La Loma del Maguay” of Tierras Coloradas, a community with around 20 inhabitants. Interviews were conducted with residents regarding the mushrooms they consume and their methods of preparation. In total, 12 species of edible mushrooms were identified, with grilling or frying being the primary methods of preparation in the region. This study reports for the first time in the state of Hidalgo the consumption of *Xerocomellus chrysenteron* and a possible first national report of the edible use of *Lycoperdon flavotinctum*. Highlights the importance of mushrooms in the community's diet, as they are not harvested for sale. Studies of this kind in small communities, where migration is a social issue, contribute to the preservation and strengthening of knowledge about edible mushrooms.

Keywords: Ethnomycology; Oak forest; Sustainability; Wild

1. Introduction

Mexico is a country renowned for its rich biodiversity and cultural heritage, which together represent traditional wisdom. Ethnomycology seeks to understand the human-mushroom relationship, studying the traditions and knowledge that human societies have of these organisms [1, 2]. From a cultural perspective, mushrooms have a significant impact in Mexico, with indigenous traditions and knowledge valuing mushrooms as part of traditional medicine and spiritual rituals for centuries [3, 4, 5].

Notwithstanding their ritual importance, the greater role of the human-mushroom relationship lies in gastronomy, where mushrooms play a crucial role in the creation of traditional dishes from pre-Hispanic times, with this knowledge being passed down to the present day by the so-called “hongueros” [6, 7, 8]. However, despite their importance, mushrooms in Mexico also face challenges such as habitat loss, pollution, and overexploitation, which threaten their populations, resulting in the loss of not only biological diversity but also cultural diversity [8].

Traditional knowledge about wild edible mushrooms is more prevalent in rural communities [9], where they form a part of their diet [10, 7, 11]. Alongside this self-consumption, mushroom gathering also contributes to family income, as they are sold in local markets known as “tianguis” [12, 13].

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In Mexico, Guzmán [14] reports approximately 4,500 species of macrofungi, of which 200 to 370 species of wild edible fungi are recorded [15, 8]. This increase in the number of reported species highlights the importance of local efforts.

Efforts to document fungal diversity in Hidalgo are scarce [16]. Villarreal and Pérez [8] report Hidalgo as the third place nationally with 126 species of wild edible mushrooms, while other local studies also represent significant advances in the knowledge of edible fungi [17, 18, 19, 20]. However, further studies are still necessary in various communities. Therefore, this work aims to present the species of wild edible mushrooms from La Loma del Maguey hill in the Tierras Coloradas community, in the municipality of Mineral del Chico, Hidalgo.

2. Materials and Methods

The Tierras Coloradas community is in the central region of the state of Hidalgo (Figure 1). The collection of wild edible mushrooms was carried out on the “La Loma del Maguey” hill (Figures 1-2). The locality has an altitudinal gradient from 2052 m.a.s.l. to 2231 m.a.s.l. at the coordinates 20°15'58.45"N, 98°47'47.27"W. The dominant vegetation is oak forest, with the presence of *Quercus potosina* Trel., *Quercus laeta* Liebm., and *Quercus rugosa* Née, associated with *Arbutus xalapensis* Kunth and *Malacomeles denticulata* (Kunth) Decne., as well as a small area with pine forest (*Pinus* sp) and another with Táscate (*Juniperus deppeana* Steud.).

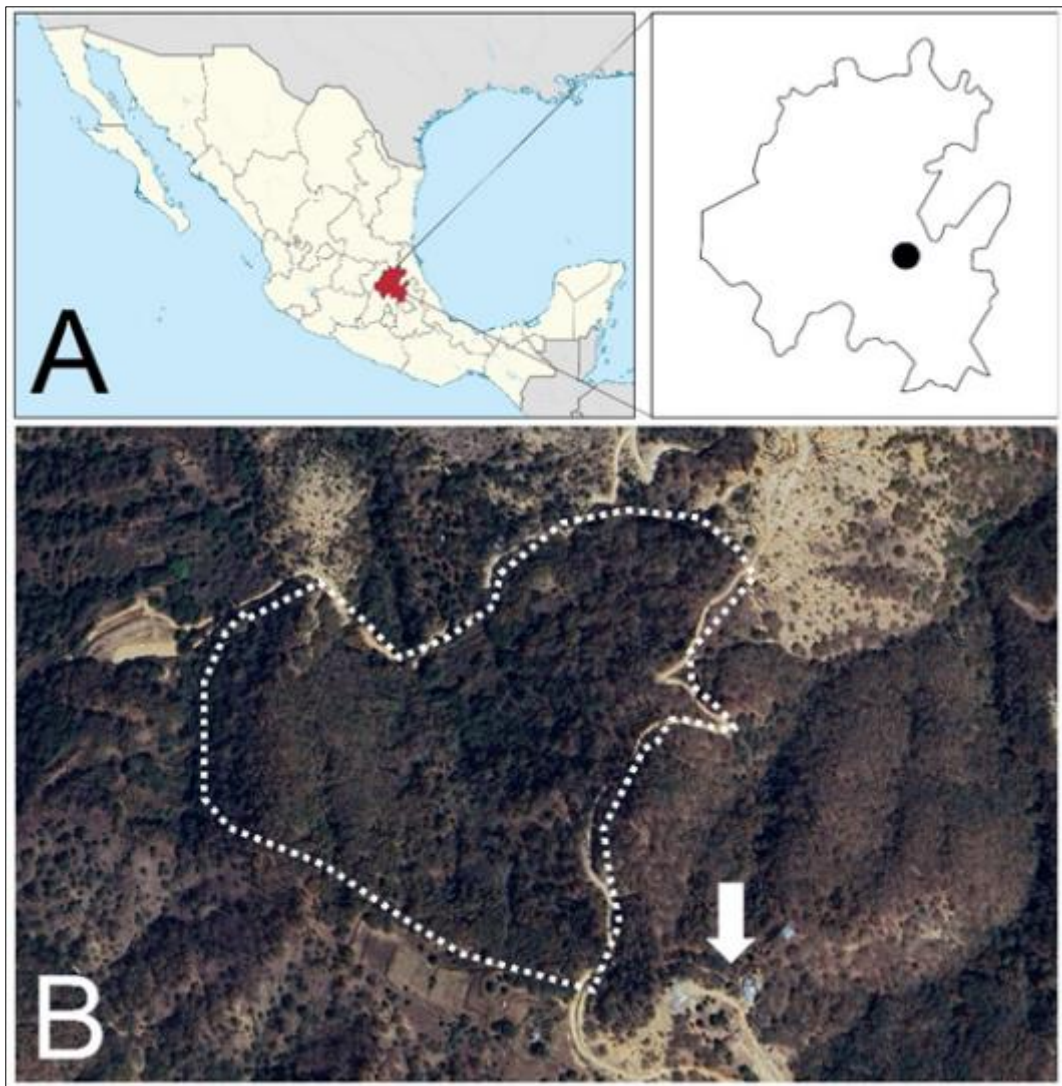


Figure 1 Geographical location of Tierras Coloradas (black point) and satellite view of La Loma del Maguey (polygon) in the state of Hidalgo, Mexico

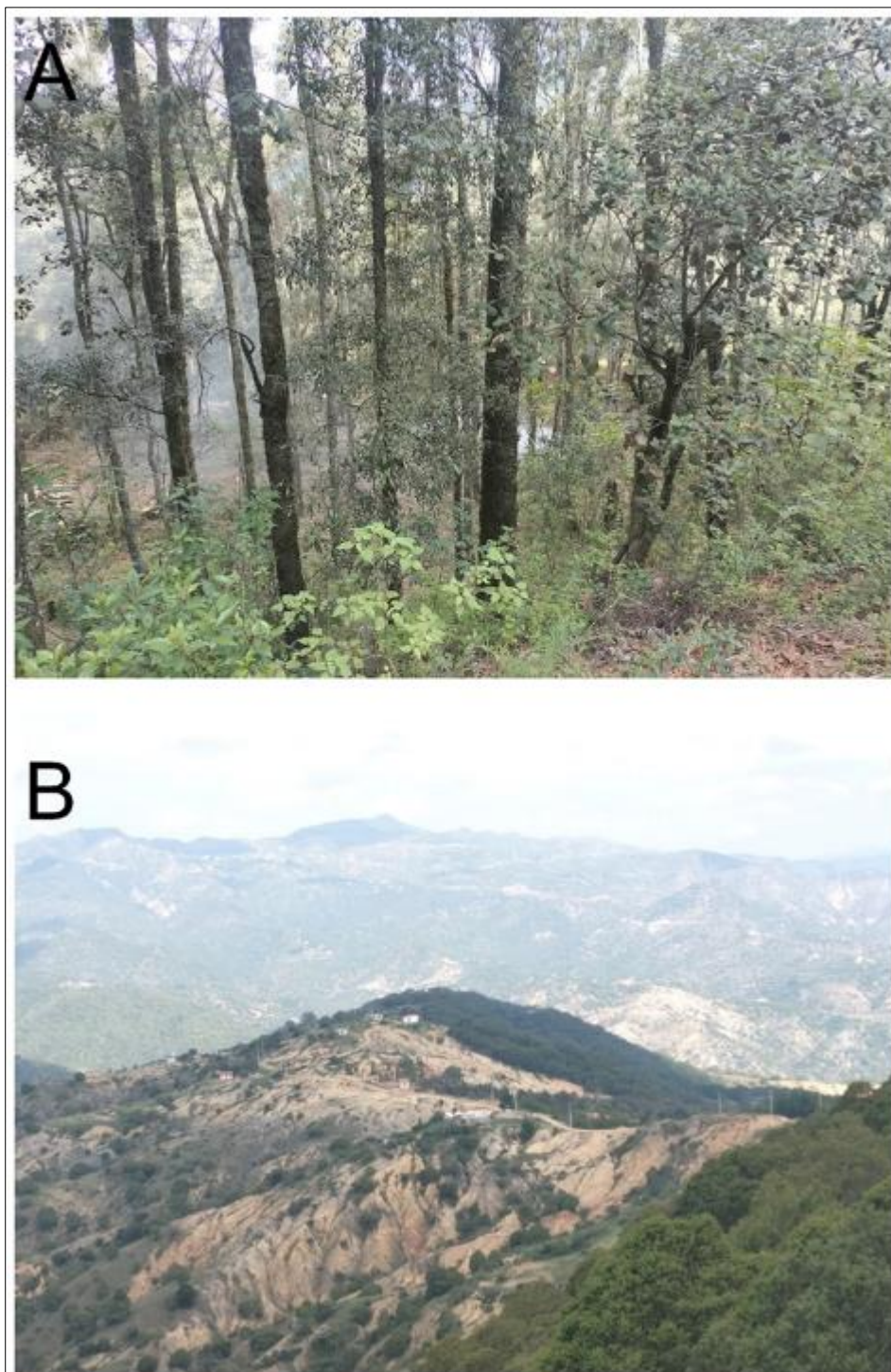


Figure 2 Study area. A. Oak forest. B. La Loma del Maguey hill, Hidalgo

Several visits to the community were made, during which mushrooms were collected in the consecutive rainy seasons of 2022 and 2023 (Figure 3). Sampling was conducted through extensive walks on the slopes of the hill, both in ravines and exposed areas. The specimens were collected following the protocol recommended in the Basic Mycology Manual by Frutis and Huidobro [21]. Subsequently, interviews were conducted with three individuals from the 24 inhabitants of the community, who are among the oldest people in the locality (Figure 3), using the snowball sampling method [22]. The most important information gathered from the interviews was the common name of the mushroom in the region, the reason for its name, and the way the mushroom is prepared.



Figure 3 A. Collection of wild edible mushrooms. B-C. Hongueros-Mushroom gatherers

The mushrooms were described fresh, and once dehydrated, the material was deposited in the Herbarium of the Facultad de Estudios Superiores Cuautitlan-UNAM (FESC). Identification at the family and species level was carried out using specialized literature [23, 24, 25] based on macroscopic evidence. The scientific names of the mushrooms were standardized in the Index Fungorum.

3. Results

In total, ten genera and twelve species of wild edible mushrooms from the La Loma del Maguey hill were recorded (Table 1, Figures 4-5). Only the genera *Lactarius* and *Ramaria* have two species; the remaining eight genera include only one edible species in the area (Table 1).

Except for the “hongo de ocote” (*Xerocomellus chrysenteron*), which grows in the pine forest area, the rest of the edible mushrooms are associated with oak forest (Table 1). The most common preparation method is grilled (nine species), followed by fried (seven species) and stewed (three species) (Table 1, Figures 7).

Table 1 List of wild edible mushrooms found in Tierras Coloradas, Hidalgo

Family	Species	Common name in Spanish	Ecosystem	Cook mode
Amanitaceae	<i>Amanita basii</i> Guzmán & Ram.-Guill.	De huevo (Egg mushroom)	Oak forest	Grilled Stewed
Boletaceae	<i>Aureoboletus russellii</i> (Frost) G. Wu & Zhu L. Yang	De ardilla (Squirrel mushroom)	Oak forest	Grilled
Boletaceae	<i>Boletus subvelutipes</i> Peck	Calado	Oak forest	Grilled
Boletaceae	<i>Exsudoporus frostii</i> (J.L. Russell) Vizzini, Simonini & Gelardi	Madroño, rojo o colorado	Oak forest	Fried Grilled Stewed
Boletaceae	<i>Strobilomyces strobilaceus</i> (Scop.) Berk.	De encino (Oak mushroom)	Oak forest	Grilled
Boletaceae	<i>Xerocomellus chrysenteron</i> (Bull.) Šutara	De ocote (Pine mushroom)	Pine forest	Fried Grilled
Ghompanceae	<i>Ramaria botrytis</i> (Pers.) Bourdot	Manitas (Hands)	Oak forest	Fried
Ghompanceae	<i>Ramaria stricta</i> (Pers.) Quél.	Manitas (Hands)	Oak forest	Fried
Hydnaceae	<i>Cantharellus cibarius</i> Fr.	De membrillo	Oak forest	Fried Grilled
Lycoperdaceae	<i>Lycoperdon flavotinctum</i> Bowerman	Pocha	Oak forest	Stewed
Russulaceae	<i>Lactarius deliciosus</i> (L.) Gray	De chile (Chilli mushroom)	Oak forest	Fried Grilled
Russulaceae	<i>Lactarius indigo</i> (Schwein.) Fr.	Chuín	Oak forest	Fried Grilled

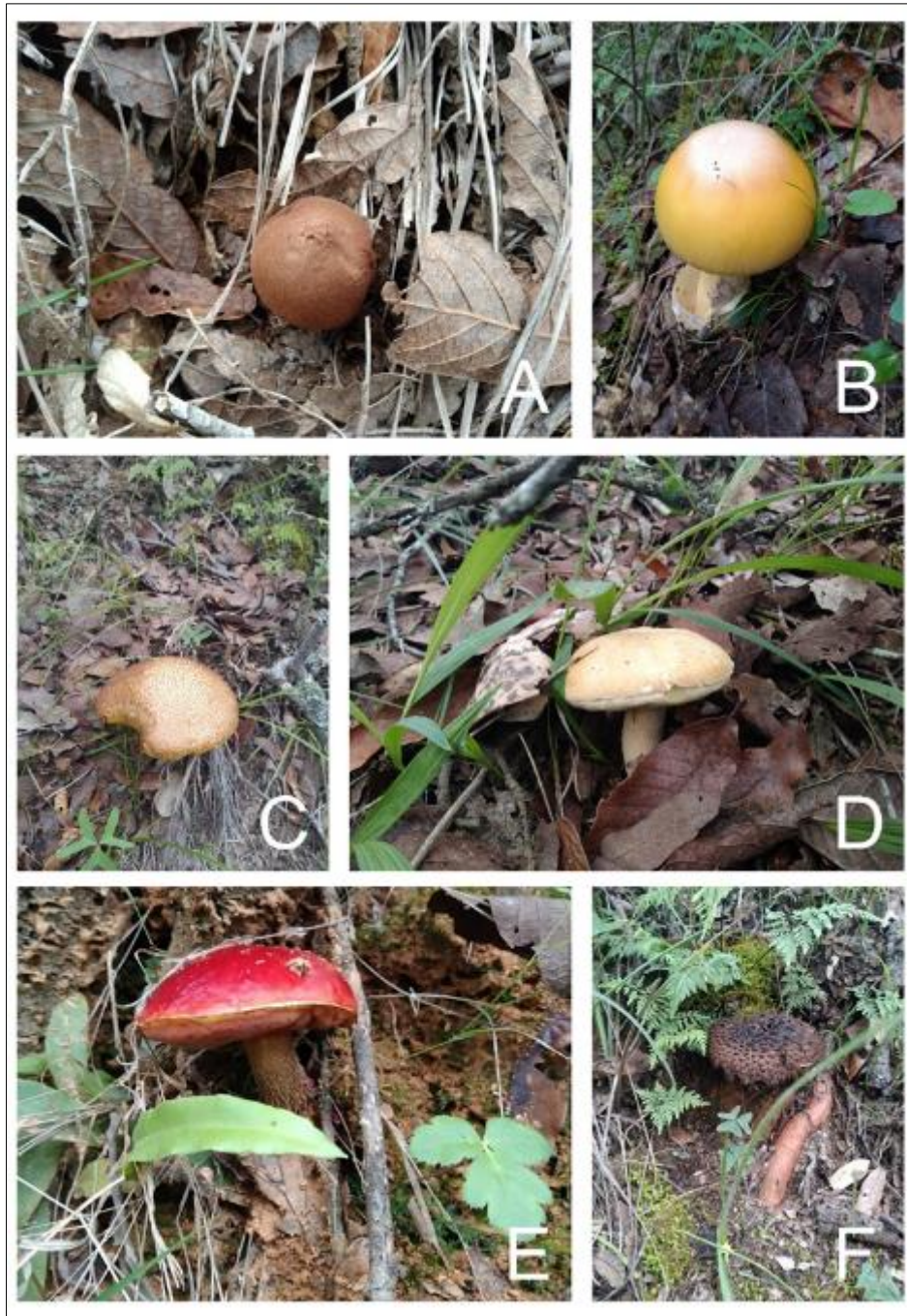


Figure 4 A. Agaricaceae. *Lycoperdon flavotinctum*. B. Amanitaceae. *Amanita basii*. C-F. Boletaceae. C. *Aureoboletus russelli*. D. *Boletus subvelutipes*. E. *Exudoporus frostii*. F. *Strobilomyces strobilaceus*.



Figure 5 A. Boletaceae. *Xerocomellus chrysenteron*. B. Cantharellaceae. *Cantharellus cibarius*. C-D. Gomphaceae. C. *Ramaria botrytis*. D. *Ramaria stricta*. E-F. Russulaceae. E. *Lactarius deliciosus*. F. *Lactarius indigo*



Figure 6 Preparation of some edible mushrooms in the area. A-B. *Exudoporus frostii*, Grilled. C. *Ramaria botrytis* and *Ramaria stricta*, Fried. D-E. *Cantharellus cibarius*, Fried

4. Discussion

Tierras Coloradas is a small locality in the state of Hidalgo with fewer than 30 inhabitants, consisting mainly of older adults, women, and children, since young people are forced to migrate to cities for lack of opportunities. This has led to the knowledge base about mushrooms being limited to a certain sector of the population, resulting in the imminent loss of important knowledge from an anthropological and cultural perspective.

In this community, a total of twelve species of wild edible mushrooms are collected during the rainy season. A crucial part of the work of the *hongueros* on La Loma del Maguey hill is the recognition of edible mushrooms from toxic ones, which they do through oral tradition from past generations and have maintained even today.

Part of the ancestral knowledge that has permeated generations is the name given to each mushroom, which can be due to numerous factors such as morphology, color, smell, associated vegetation, homologies with their environment, and even the taste of the mushroom [9, 26, 27, 28, 29]. In Tierras Coloradas, the name “madroño,” “rojo,” or “colorado” (*E. frostii*) refers to the color of the mushroom or its association with the Madroño (*Arbutus xalapensis*), whose bark also presents reddish colorations. The “manitas” (*R. botrytis* and *R. stricta*) are named for their characteristic growth shape that, according to the locals, resembles hands, and the “hongo de huevo” (*A. basii*) is named as such because when the mushroom emerges from the ground, it is still covered by the veil and appears in the shape of an egg. The “hongo de membrillo” (*C. cibarius*) is known by that name because it emits a characteristic quince smell, a Rosaceae typical of some family orchards.

The “hongo de encino” (*S. strobilaceus*) and the “de ocote” (*X. chrysenteron*) are named in reference to their associated vegetation, with the former invariably associated with an oak tree, while the latter is linked to the small coniferous area of the region. The name “chuin” (*L. indigo*) was assigned to the mushroom due to its color similarity to a bird residing in that forest, both having bluish tones. Mushrooms named according to their taste include “el calado” (*B. subvelutipes*) for its lime taste and “de chile” (*L. delicious*) for its slight spiciness. There are records of the common names of two other organisms, “de ardilla” (*A. russelli*) and “pocha” (*L. flavotinctum*), for which the locals do not know the origin of the common name.

The collection of wild edible mushrooms in the community is solely for self-consumption and not for sale, a practice already reported in similar studies [26, 18, 19, 11, 30]. The main reason for this is the distance to nearby areas where they can be marketed. This underscores the high intrinsic value that mushrooms represent for the population, as they are an important food resource, serving as a main and habitual ingredient in the community's diet during the rainy season.

Once collected, mushrooms are prepared in three main ways: roasted, fried, or stewed, with roasting being the most common method, also, Hernández's [18] report that the most popular preparation methods in the region are roasting and frying.

It is noteworthy that out of the 126 species of edible mushrooms in the state of Hidalgo recorded by Villarreal and Pérez [8], twelve species were found on La Loma del Maguey hill, representing about 10% of the edible mushroom species in the state located in a small region. In relation to that work, eight species are present in our study area: *A. russelli*, *E. frostii*, *S. strobilaceus*, *C. cibarius*, *R. botrytis*, *R. stricta*, *Lactarius deliciosus*, and *Lactarius indigo*, while four are additions to the edible mushrooms reported in that work for the state: *B. subvelutipes*, *A. basii*, *X. chrysenteron*, and *Lycoperdon flavotinctum*.

Of these, the mushrooms “el calado” (*B. subvelutipes*) and “de huevo” (*A. basii*) have already been previously reported as edible in Hidalgo [17, 31], while *X. chrysenteron* and *Lycoperdon flavotinctum* represent new records of edible mushrooms in the state, where *L. flavotinctum* is poorly known as an edible species. As with *Lycoperdon candidum* [32], the genus *Lycoperdon* is not as commonly consumed in other parts of the state, possibly due to limited culinary knowledge.

In the community of Tierras Coloradas, the inhabitants recognize edible mushrooms by their shape, color, size, smell, and growing environment. They primarily identify mushrooms by using macromorphological characters as well as ecological and ethno-cultural features. They categorize them based on their form, growth, color, aroma, taste, or the vegetation with which they are associated. They have extensive knowledge of wild edible mushrooms and distinguish them from inedible or poisonous ones, which highlights the cultural value of this resource as well as the need for studies and efforts to preserve and disseminate this knowledge.

5. Conclusion

Ethnomycological research in the state of Hidalgo is limited to certain areas, and the central region, where Tierras Coloradas is located, is no exception. Due to the socio-cultural value of wild edible mushrooms in the study area, it is vital to highlight their role as part of the culinary and cultural heritage of the Tierras Coloradas community. For this reason, it is essential to study and document the wild edible mushrooms in the region as well as the surrounding areas, to safeguard ancestral knowledge that is at risk of disappearing.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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