

Hallucinogenic, Medicinal, and Edible Mushrooms in Mexico and Guatemala: Traditions, Myths, and Knowledge

Gastón Guzmán

Instituto de Ecología, Apartado Postal 63, Xalapa, Veracruz 91000, Mexico

ABSTRACT: The traditional uses of mushrooms as food, curatives, and in sacred or religious rites among the Mexican and Guatemalan Indians are discussed. The Indian knowledge of mushrooms was represented in stone or ceramic figures or on codices, or through legends, all before or at the beginning of the 16th century. Unfortunately most of the pieces and codices were lost during the Spanish Conquest; in addition, the Indians are slowly losing their traditions. However, it is possible to learn many interesting things mainly from the Aztec, Purepecha, and Maya cultures, which are discussed here. The sacred use of *Amanita muscaria* among the Indians is reviewed. The traditions and diversity of the hallucinogenic species of *Psilocybe* and also some *Cordyceps* are also discussed, of which *Psilocybe* presents approximately 45 species in the region. Interesting and mysterious Indian ceremonies in Mexico involving these mushrooms, which are a mixture of both Indian and Christian rites, are described. The curative fungi, among which puffballs, polypores, some phallaceous fungi, and some ascomycetes and lichens are very important, are also reviewed in their many applications in traditional medicine. Finally, the common traditions of more than 200 edible species of mushrooms are discussed, showing the high number of common names, more than 3000, both in Indian and Spanish languages, in Mexico and Guatemala. In relation to these, the molds that are used to elaborate traditional beverages are reviewed.

KEY WORDS: ethnomycology, Indians, mushrooms, edible, curative, sacred, medicinal mushrooms.

INTRODUCTION

In spite of the high diversity and traditions regarding mushrooms, both in Mexico and in Guatemala, they have not been well studied, neither regarding their uses and properties nor their taxonomy and inventories (Guzmán, 1984, 1998a; Torres, 1984; Ulloa et al., 1987a,b; Nishida, 1989; Sommerkamp and Guzman, 1990; Sommerkamp, 1991, 1994). Several Indian codices described the use of edible, medicinal, and sacred mushrooms mainly among the Aztec and Maya cultures. Together with pottery figures, mushroom stones, and legends, they have generated an interesting mystery surrounding these organisms among the Indians both in the past and the present (Schultes and Hofmann, 1979; Wasson, 1980; Guzmán, 2001) (Fig. 1). It is not surprising to learn that the Indians distinguish very well the edible species from the poisonous, as well as identify the sacred and curative mushrooms, in more than 3000 common

names, as previously discussed by the author (Guzmán, 1997).

The discovery in the 1950s of the use and cult of the hallucinogenic mushrooms in Mexico (Wasson and Wasson, 1957; Heim and Wasson, 1958; Singer, 1958) coincided with the development of mycology, both in Mexico and Guatemala (Guzmán, 1984, 1990). In fact, the Mexican institutions working with fungi excelled in several fields of mycology. Ethnomycology was born and several studies were conducted, including those of Wasson and Wasson (1957), Heim and Wasson (1958), Singer (1958), and Wasson (1980), as well as the contributions of Guzmán (1959a,b), Lowy (1972, 1977, 1980), Schultes and Hofmann (1979), Mapes et al. (1981), Mata (1987), Estrada-Torres and Aroche (1987), Chacón (1988); and many others.

However, there are three main problems in the development of ethnomycological studies in the region: (1) the great destruction of wild vegeta-



FIGURE 1. A folkloric representation of the traditional uses of fungi in Mexico, linked strongly to both the Indian and Christian religions. The image at the top on the left shows the early use of *Amanita muscaria* with the little stone button from the Purepechas, and on its right a pottery representation of an *A. muscaria* with a little Indian seated below. The image at the top on the right shows a representation of the adoration of "teonanácatl," the sacred mushroom of the Aztecs in a codice from Sahagún work. A mushroom stone from the Maya culture is in the middle part; on the left there is a church as a representation of Christianity, and on the left of it an Indian surrounded by edible, poisonous, and sacred mushrooms observing the church. On the right of the mushroom stone there is an Aztec pottery figure with four Indians surrounding a tall sacred mushroom belonging to one *Psilocybe* (?*P. zapotecorum*). Below the mushroom stone there are several sacred mushrooms belonging to *Psilocybe* (one *P. mexicana*, two *P. zapotecorum*, and two *P. caerulescens*), and one sacred *Cordyceps* on the left. Below and on the left of the plate is a witch doctor with several sacred little mushrooms in front of him, and on the right three species of medicinal fungi (one *Geastrum*, several *Coriolus versicolor*, and three *Lycoperdon*), and above of them is *Ustilago maydis*, the famous edible and medicinal mushroom of the Aztecs, known as "huiltacoche." (Reproduced in part with modifications from Heim and Wasson, 1958; Schultes and Hofmann, 1979; Guzmán, 1997).

tion; (2) the small number of specialists on fungi in the region; and (3) the loss of traditions among the Indians, owing to the advancement of modern civilization, which means that this knowledge has become unavailable, as discussed recently by the author (Guzmán, 1997, 1998a). The loss of wild vegetation (e.g., several types of forests and jungles) is drastically affecting the development of the mushrooms and is strongly reducing the rates of fructification of several species. Consequently, the Indians little by little are losing the custom of gathering and using mushrooms. It is thus vital to be familiar with the mushrooms and their diversity, their role in the nature, and their potential utility before they disappear (Subramanian, 1982; Guzmán, 1998a, based on Hawksworth 1993; Smith et al. 1993, among others).

In the present article, the Indian knowledge of mushrooms, the use of several species both as food and/or as medicine, as well as the mysterious Indian ceremonies relating to the sacred mushrooms are discussed, together with the available information on the properties of these mushrooms.

MATERIALS AND METHODS

The exhaustive review of all the available bibliography on the subject is the basis of this contribution. However, the field work developed by the author during more than 45 years, his contacts with the Indians that have provided him with valuable information, and his researches (e.g., Guzmán, 1959, 1983a,b, 1984, 1987, 1990, 1994, 1997, 1998a,b, 2000, 2001, and in Mapes et al., 1981) are the main support for this study. More than 60 species of fungi considered in this article are classified in Table 1.

USE OF *AMANITA MUSCARIA* AMONG AMERICAN INDIANS

Amanita muscaria, known as “fly agaric” in the English literature, is well known throughout most of the world for its attractive color and fruiting body shape and for its “strong” poison, which is not fatal, but is hallucinogenic and produces stomach disorders. These properties together with

its abundance caused the spread in the use of this mushroom a long time ago in the Northern Hemisphere, where the mushroom is common. *A. muscaria* was probably the first sacred mushroom used by humans at the beginning of our civilization (Wasson and Wasson, 1957; Schultes and Hofmann, 1979; Wasson, 1980). Wasson (1968) and Wasson et al. (1986) also related this mushroom with Soma, an important god in India. Wasson (1980) assumed that the use of this mushroom spread from India to Europe and Siberia. It seems that the Vikings used this mushroom in their wars (Ramsbottom, 1953; Wasson and Wasson, 1957).

In France there is an old chapel dating from 1291 where a rare branched specimen of *A. muscaria* as the tree of good and evil, with Adam, Eve, and the serpent on the stem of the mushroom, is offering the traditional apple to Eve is represented in a fresco (Ramsbottom, 1953; Samorini, 1997). This fact is very important, because it shows how deep the use of *A. muscaria* was in earlier centuries and how it was linked with religion. Another important observation is that in the fresco, both Adam and Eve are represented as the same height as the mushroom, which, as discussed later, relates to the hallucinogenic effects of *A. muscaria*. Like the Mexican hallucinogenic mushrooms, it produces a nanism. However, Wasson (1968) and Wasson et al. (1986) rejected the identification of *A. muscaria* in the fresco, as Ramsbottom (1953) noted (p. 48). Nevertheless, at present *A. muscaria* is used as a shamanic mushroom in Europe (e.g., Lithuania, Wasson, 1980). In Siberia this mushroom is used also in shamanic or religious ceremonies (Wasson and Wasson, 1957; Schultes and Hofmann, 1979). The American Indians used *A. muscaria* from the time Asians arrived in America through the Bering Strait. There is information about the use of *A. muscaria* among the Ojibway Indians as well as other tribes in the United States (Wasson, 1979; Navet, 1988).

The use of *A. muscaria* in Mexico (Fig. 1) is related to the migration of the American tribes from the north to the south, and their inheritance from the Siberian tribes. However, as the distribution of *A. muscaria* to the south in the American continent is more scarce, in Mexico this mushroom is not so abundant, in contrast to Canada and the United States, and in high contrast with the *Psilocybe* mushrooms. Nevertheless, there is

TABLE 1
Classification of the Species of Fungi Considered in this Article

Zygomycetes	<i>Copelandia cyanescens</i> (Berk. et Br.) Sing.
<i>Mucor</i> spp.	<i>Lactarius deliciosus</i> (L.: Fr.) S.F. Gray
<i>Rhizopus</i> spp.	<i>L. indigo</i> (Schw.: Fr.) Fr.
Ascomycetes	<i>L. salmonicolor</i> R. Heim et Leclair
<i>Cordyceps capitata</i> (Holms.: Fr.) Link	<i>Panaeolus sphinctrinus</i> (Fr.) Quéf.
<i>C. ophioglossoides</i> (Fr.) Link	<i>Pleurotus djamor</i> (Fr.) Boedijn
<i>Elaphomyces</i> spp.	<i>P. levis</i> (Berk. et M.A. Curtis) Sing.
<i>Hansenula</i> spp.	<i>P. opuntiae</i> (Dur. et Lév.) Sacc.
<i>Helvella crispa</i> Scop.: Fr.	<i>P. smithii</i> Guzmán
<i>Hypomyces lactifluorum</i> (Schw.: Fr.) Tul.	<i>Psilocybe caeruleascens</i> Murr.
<i>Morchella costata</i> Vent.	<i>P. cordispora</i> P. Heim
<i>M. elata</i> Bull.: Fr.	<i>P. cubensis</i> (Earle) Sing.
<i>M. esculenta</i> Pers. ex St. Amans	<i>P. mexicana</i> R. Heim
<i>Pichia</i> spp. (as <i>P. membranaefaciens</i> E.C. Hansen)	<i>P. yungensis</i> Sing. et A.H. Smith
<i>Saccharomyces</i> spp. (as <i>Saccharomyces cerevisiae</i> Meyer ex E.C. Hansen)	<i>P. zapotecorum</i> R. Heim emend. Guzmán
<i>Zygosaccharomyces bailii</i> (Lind.) Guillerm.	<i>Russula brevipes</i> Peck
Basidiomycetes	<i>R. cyanoxantha</i> Schaeff.: Schw.
Ustilaginales	<i>R. olivacea</i> (Schaeff.: Schw.) Fr.
<i>Ustilago maydis</i> (DC.) Corda	<i>Suillus brevipes</i> (Peck) Kuntze
Aphylllophorales	<i>Tricholoma magnivelare</i> (Peck) Redhead
<i>Coriolus versicolor</i> (L.:Fr.) Quéf. (=Trametes versicolor (L. Fr.) Prl.)	Gasteromycetes
<i>Pogonomyces hydroides</i> (Sow.: Fr.) Murr.	<i>Calvatia gigantea</i> (Batsch: Pers.) Lloyd
<i>Pycnoporus sanguineus</i> (L.: Fr.) Murr.	<i>Clathrus crispus</i> Turpin
<i>Ramaria flava</i> (Fr.) Quéf.	<i>Dictyophora indusiata</i> (Vent.: Pers.) Desv.
<i>Thelephora cervicornis</i> Corner	<i>Geastrum saccatum</i> Fr.
Agaricales	<i>Lycoperdon perlatum</i> Pers.
<i>Agaricus campestris</i> L.: Fr.	Lichens
<i>Amanita basii</i> Guzmán et Ramírez-Guillén	<i>Cora pavonia</i> (Schw.) Fr.
<i>A. caesarea</i> (Scop.: Fr.) Pers.	<i>Pseudevernia consocians</i> (Vain.) Hale et W.L. Culb.
<i>A. jacksonii</i> Pomerleau	<i>Ramalina eckloni</i> (Spreng.) Mayer et Flot.
<i>A. laurae</i> Guzmán et Ramírez-Guillén	<i>Usnea strigosa</i> (Ach.) Eaton
<i>A. tecomate</i> Guzmán et Ramírez-Guillén	Mitosporic fungi
<i>A. tullossii</i> Guzmán et Ramírez-Guillén	<i>Alternaria</i> spp.
<i>A. yema</i> Guzmán et Ramírez-Guillén	<i>Aspergillus</i> spp.
<i>Boletus aestivalis</i> Paul.: Fr.	<i>Candida</i> spp. (as <i>C. famata</i> (Harrison) Novák et Zsott)
<i>B. edulis</i> Bull.: Fr.	<i>Cladosporium</i> spp.
<i>B. pinophilus</i> Pii. et Derm.	<i>Fusarium</i> spp.
<i>Cantharellus cibarius</i> (Fr.:Fr.) Frz.	<i>Kloeckera</i> spp.
<i>Clitocybe gibba</i> (Pers.: Fr.) P. Kumm.	<i>Paecilomyces</i>

some evidence of the sacred use of *A. muscaria* among the Mexican Indians belonging to the Aztec, Purepecha, and Maya cultures. The Aztecs left a small and lovely ceramic figure, which represents a little Indian seated beneath a cap of *A. muscaria* (Schultes and Hofmann, 1979) (Fig. 1). Again, here are the nanism effects shown in the fresco from the church in France! The evidence from the Purepechas is a little mushroom stone 34 mm high found in an archaeological site, which

represents a button of *A. muscaria* on one side, perhaps the front, but on the back a skull is represented (Guzmán in Mapes et al., 1981; Guzmán, 1984, 1992). Among the Mayas there are two examples of the sacred use of *A. muscaria* in two codices, the Madrid and the Dresden, according to Lowy (1972, 1980), as well as the Thunderbolt Legend. Lowy (1972) found in the Madrid Codex an Indian making an offering to an important person; the offering is a special object in the Indian's

right hand, which Lowy deduced to be a stylized fruiting body of *A. muscaria*, with its typical wart-like patches on the cap. The Dresden Codex shows several men falling through space, with special leaves on their body represented on it. Lowy (1980) supposed that those leaves are stylized mushrooms related to *A. muscaria*.

However, for Schultes and Hofmann (1979) and others these leaves of the men in the Dresden Codex belong to hallucinogenic plants such as *Turbina corymbosa* L. Raf. or *Salvia divinorum* Epl. et Jativa-M., which the Indians of Mexico and Guatemala use at present as narcotic plants. Nevertheless, Guzman (2001) presented another interpretation of the leaves of the falling men of the Dresden Codex. Guzmán supposed that those leaves are related to with the edible corn smut fungus, *Ustilago maydis*, that the Mayas (still today) call "ta chak," among other common names, all of which are related to Chak, the god of rain (Guzmán, 1983; Mata, 1987). They believe that this mushroom falls on the corn from the rain, and has the concentrated violence of the thunderbolt. This last idea relates *Ustilago maydis* with the Thunderbolt Legends that Lowy (1972) connected with *A. muscaria*. Lowy (1977, 1980) thought that the Thunderbolt Legend was related to the cult of *A. muscaria*, because the Indians of Guatemala and Chiapas (both from the Maya culture) call this mushroom "kaquilja" and "itzel ocox," meaning thunderbolt and evil mushroom, respectively. *A. muscaria* is linked to the strong and rare power of the thunderbolt, according to Lowy (1977).

Also, *A. muscaria* is a common mushroom, but not so abundant in the pine forests of the highlands of both Guatemala and Chiapas. Another common name of this mushroom in the region is "yuyo del rayo," which means like the yuyo, an edible mushroom identified with the *A. caesarea* complex (e.g., *A. jacksonii*, *A. laurae*, and *A. yema*) (Guzmán and Ramírez-Guillén, 2001), and rayo, which means a thunderbolt. Nevertheless, there is the question, Is the Thunderbolt Legend related to *A. muscaria* or to *Ustilago maydis*? The first relates to its rare power and the second to the idea that the mushroom falls from the sky with a strong power with the rain. This question shows how sparse our knowledge still is not only of the Maya culture, but also of all the Indian Mesoamerican cultures.

THE HALLUCINOGENIC MUSHROOMS

These mysterious and interesting mushrooms, used by the Mesoamerican Indians before the Spanish Conquest, were discovered in the 1950s, by Wasson and his wife in Mexico (Heim, 1956; Wasson and Wasson, 1957; Heim and Wasson, 1958; Guzmán, 1959a). This important discovery attracted the attention of several scientists, such as Singer, who arrived to Mexico in 1957 looking for these rare mushrooms (Singer, 1958). However, Singer (1949, pp. 472 and 506) briefly discussed these mushrooms early based on the finding by Schultes in 1938 in Mexico (Schultes, 1939). Nevertheless both Schultes' and Singer's contributions at that time were very limited, and knowledge of hallucinogenic mushrooms really began with Wasson, as discussed previously by Guzmán (1990).

Related to the hallucinogenic mushrooms are the well known "mushroom stones" from the Maya culture. Wasson and Wasson (1957) presented these pieces as evidence of the ritual involving hallucinogenic mushrooms in the Maya region. Nevertheless, Guzmán (1984, 1992) discussed the possible relationship of these mushroom stones to edible mushrooms, because of the similarity in appearance of these pieces to the *Boletus edulis* group, a common edible mushroom in the temperate forests of the highlands of the Maya region. There is some evidence that the Indians used these figures in the agricultural lands as good indications for good crops. These mushroom stones are common in Guatemala but rare in Mexico. They are pieces around 38 cm high, and represent a standing man or animal under a big, round mushroom cap. Nevertheless, Wasson (1980) found two other interesting mushroom stones in which a falling man is represented with his feet supporting the cap of the mushroom. These falling men figures have a strong relationship with the hallucinogenic effects of the sacred mushrooms, because the faces of these figures express almost a type of ecstasy and the person seems to be flying in space (Lowy, 1980). Even Lowy (1980) related these figures to those of the falling men from the Dresden Codex as discussed previously.

The hallucinogenic mushrooms in Mesoamerica belong mainly to the genus *Psilocybe*, but not to *Panaeolus sphinctrinus*, as was mis-

takenly first reported (Schultes, 1939; Singer, 1949), or to *Stropharia* (reported by Heim and Wasson, 1958). Some species of *Cordyceps*, such as *C. capitata* and *C. ophioglossoides* (Fig. 1), and their host, *Elaphomyces* spp., are related and used as sacred mushrooms in ceremonies linked to the use of the hallucinogenic *Psilocybe*, such as *P. muliercula* in the central part of Mexico (Guzmán, 1959a; 1997). In reference to *Psilocybe*, we know more than 100 hallucinogenic species in America (Guzmán, 1983a, 1995), of which around 20 are from the United States and Canada, around 45 are from Mexico, and no more than 40 are from Central and South America and the Caribbean, which represent around the 60% of the known species in the world. However, the taxonomic study of these mushrooms seems to go on and on, because there new species are frequently found (Guzmán, 1998b, 2000b; Guzmán et al., 1997, 1999, 2001). Nevertheless, only in Mexico is there evidence of the religious use of these mushrooms, mainly among the Aztec, Mazatec, and Zapotec Indians. From the first there is a nice ceramic piece (Fig. 1), showing four Indians or shamans standing up in a circle holding hands and surrounding a tall mushroom in the center of the circle. This mushroom is higher than the Indians and it shows the form of a typical hallucinogenic *Psilocybe*, very similar to *P. zapotecorum*, with an umbo in its pileus. Again another example of nanism is found here as previously discussed in relation to *Amanita muscaria*.

Sahagún (1569–1582) in his great work on the knowledge and customs of the Aztecs, together with his two Florentino and Magliabechiano Codices, both drawn by Indians following Sahagún's directions, showed the use of the edible, medicinal, and hallucinogenic mushrooms. The hallucinogenic mushrooms were identified as "teonanácatl," an Aztec word that means divine mushroom. Sahagún described the use of the hallucinogenic mushrooms by the Indians, and in the Magliabechiano Codex the ingestion of teonanácatl by an Indian is represented (Fig. 1). The Indian sits and eats a mushroom, gathered just in front of him where the fungi are growing. Behind the Indian there is a monster or the devil according to the interpretation of the Church, or the god

of the mushroom who takes the Indian on his world, according to the Indian's interpretation (Wasson and Wasson, 1957; Heim and Wasson, 1958; Guzmán, 1984).

In relation to the sacred fungi there is an interesting and unique church in Mexico, located close to the town of Chignahuapan, in the State of Puebla. This church was surprisingly built in honor of a mushroom (Guzmán et al., 1975; Guzmán, 1990) (Fig. 1)! It is a very rare case, where an old fruiting body of *Ganoderma lobatum* is venerated, because it has in the pore surface a drawing of Christ. According to the Indians of the region, the mushroom was found in a trail in the forest by an Indian in the 19th century. It was considered a miracle and it has been passed through the years from house to house to give health to the people who request it. In 1941 a priest thought it was a good idea to build a special church for the mushroom to avoid its being moved from house to house. The church was named "Nuestro Señor del Honguito" (Our Lord of the Little Fungus), and later "El Señor de la Salud" (The Lord of Health).

Nevertheless, Guzmán (1959b, 1990) and Guzmán et al. (1975) considered that the veneration of the mushroom of Chignahuapan's Church has a strong relationship with the use of the sacred hallucinogenic mushrooms belonging to *Psilocybe* that grow in the ravines of the region. He observed in one case that the Indians ate *P. caerulescens* and *P. mexicana* in a ravine where they had improvised little Christian altars in the walls of the ravine. It is possible that the authorities of the church in the town of Chignahuapan were trying to figure out why the Indians did not visit the main church of the town, and they found out that the Indians were eating mushrooms. But, as the psilocybes are so little and dark that they are difficult to find in the field, they found instead a fruiting body of a *Ganoderma* that is very common in the region where they drew Christ to show it as a miracle, so they attracted the attention of the Indians to the church. However, at present, that church dedicated in honor of the mushroom is now named in honor of a Spanish saint and in the Sunday ceremonies they do not say anything about the mushroom. The mushroom was first kept in a crystal box in the main part of the altar,

but now it is inside a little metal box with a lens, and then inside a big metal cross. This cross is in a corner of the church. Nevertheless, Guzmán et al. (1975) observed that when arriving at the church, the Indians first go to see the mushroom and pray, and then they go back to the main door of the church, to the front of the church, and to the main altar.

The main hallucinogenic species of *Psilocybe* that the Mexican Indians eat in their ceremonies are *P. caerulescens*, *P. cordispora*, *P. cubensis*, *P. mexicana*, *P. yungensis*, and *P. zapotecorum*, among the Mazatec Indians and Aztec of the subtropical regions (e.g., Chignahuapan), but they eat *P. aztecorum* and *P. muliercula* in the temperate central parts of the country (Heim and Wasson, 1958; Singer, 1958; Guzmán, 1959a, 1983a, 1984) (Fig. 1). There is no information about the use of the sacred psilocybes in Guatemala, where their use seems to have been lost some time ago. However, *P. cubensis*, *P. mexicana*, and *P. zapotecorum* are known in Guatemala (Lowy, 1977; Sommerkamp, 1994). This later author reported erroneously "*Psilocybe cyanescens*," which is really *Copelandia cyanescens*.

Referring to the ceremonies in which hallucinogenic mushrooms are eaten, these are linked to the Christian religion. They are celebrated during the night to avoid noise and distractions, because the effects of the mushrooms are very strong. The ceremonies are presided by an old man, woman, or shaman, who is in front of an altar in his house, and who prays in a mixture of both Spanish and the Indian languages. They sing their prayers and pass the mushrooms over incense. After this, they give the mushrooms to the Indians to eat in silence. The Indians eat the mushrooms looking forward to speaking with God, to ask Him for healing or to ask about dead relatives. The symptoms begin with illusions and then with hallucinations, both colorful.

The effects start approximately half an hour after the ingestion. The person is quiet and needs to stay seated and to not have eaten dinner before, and it is necessary to avoid alcoholic drinks or smoking. One of the first sensations is a nanism, because all surrounding things look bigger as a result of the illusions. The effects take around 5–6 h, and the dosage is 12 fruiting bodies of one

species of a mushroom. The mushrooms are fresh or dry, but the dry types cannot be kept more than one year because the mushrooms lose their properties. Also, the author observed that the alkaloids (psilocybin and psilocyn) are volatile and produce hallucinations by inhalation. These Indian ceremonies are disappearing little by little, with the advancement of civilization; they are even forbidden by government authorities. Foreigners, mainly young North American people, use these mushrooms in an exaggerated way mixed with drugs or alcohol, with dangerous consequences to their health and to the traditions. High doses of these mushrooms can even cause death.

MUSHROOMS IN TRADITIONAL MEDICINE

Some time ago the Mesoamerican Indians used several species of mushrooms to cure some ailments or illnesses (Sahagún, 1569–1582; Mapes et al., 1981; Alfaro et al., 1983; Martínez-Alfaro et al., 1983; Estrada-Torres and Aroche, 1987; Mata, 1987; Chacón, 1988; Pérez-Silva et al., 1988; Godínez and Ortega, 1989; Guzmán, 1994, 1997). They used several species of fungi, among them puffballs, polypores, some phalloceous fungi, lichens, and some Ascomycetes in more than 40 types of actions to cure afflictions such as asthma, colds, constipation, diabetes, dysentery, epilepsy, erysipelas, eye infections, fever, gastrointestinal disorders, grains of the skin, insect bites, intestinal antinflammatory, intestinal ulcers, nervous disorders, neuritis, pellagra, ringworm, sexual impotence, stomach aches, toothache and wisdomteeth, ulcers and warts, or as an antibiotic, antirheumatic, antiinflammatory, antitumoral, antiparasitic, antifungal, aphrodisiac, aid in recovering from fatigue, digestive, diuretic, hemostat, pectoral, purgative or laxative, rejuvenative, to stimulate milk secretion, to clean the mouth, to cure the umbilical cord, to produce vigor, and for good memory, all of them in one or several ways. Also some fungi are used in popular remedies to cure "mal de ojo" (evil eye), or they are used to hear voices or to speak with the dead.

Thirty-seven species of fungi from Mexico are known to be used in 38 different curative prop-

erties in traditional medicine (Guzmán, 1994). For *Pleurotus*, Guzmán (2000a) considered 37 medicinal properties according to the world bibliography. In Mexico *Pleurotus* (e.g., *P. djamor*, *P. levis*, *P. opuntiae*, *P. smithii*) are recommended to reduce cholesterol levels; to alleviate diabetes, high blood pressure; nervous disorders; to promote good memory; as an antiparasitic; for sexual dysfunction; for rejuvenation; as a laxative; to darken hair; as an intestinal anti-inflammatory; and for intestinal ulcers. They use small fragments or powder from dry specimens. They also make capsules for the commercial distribution of these fungi. On the other hand, Indians frequently use *Calvatia* spp. (e.g., *C. gigantea*), *Coriolus* (= *Trametes*) *versicolor*, *Lycoperdon* spp. (e.g., *L. perlatum*), *Geastrum* spp. (e.g., *G. saccatum*), *Pogonomyces hydroides*, *Thelephora cervicornis*, and *Pycnoporus sanguineus* to prevent hemorrhages; as a purgative; to cure insect bites; to cure the umbilical cord, grains, and ringworm or warts; and against dysentery or as an anti-inflammatory of the feet, respectively (Guzmán, 1994). Lichens such as *Cora pavonia*, *Pseudevernia consocians*, *Ramalina eckloni*, and *Usnea strigosa*, among others, are used mainly as pectorals (Mapes et al., 1981; Godínez and Ortega, 1989). In Yucatan *Geastrum saccatum* is used to stop diarrhea in children and *Clathrus crispus* to control some eye infections through the liquid that is obtained when the mushroom is squeezed (Guzmán, 1983b, 2001). In Oaxaca *Dictyophora indusiata* is used for magic purposes (Heim and Wasson, 1958), and *Pycnoporus sanguineus* in Chiapas also for painting the cheeks of Indian girls, as the author observed recently.

The gelatinous mass of yeasts and bacteria known as “hongo chino del te” (the Chinese fungus of tea), “hongo milagroso” (the miraculous fungus), or “hongo de la India (the fungus from India), among several names, is a very popular fungus used as a remedy for many people in the cities of Mexico. They use it for good digestion, for sexual impotence, as a diuretic, to produce vigor and for rejuvenation, among other uses. This mass is a mixture of several yeasts, such as *Pichia membranaefaciens*, *Saccharomyces cerevisiae*, *Candida famata*, and *Zygosaccharomyces bailii*, among many others microorganisms (Ulloa et al., 1987a; Guzmán, 1997).

THE EDIBLE MUSHROOMS

There are more than 200 wild species of edible mushrooms used both in Mexico and Guatemala, all of them sold in popular markets in thousand of specimens. It is possible to find streets where the only products for sale are mushrooms. Visiting these markets is truly a mycological party, in terms of the abundance, color, and variety of mushrooms. The Indians gather the edible mushrooms in the forests (mainly in pine and oak forests) and after a classification through several common names, they sell them in the markets. Guzmán (1997) found more than 3000 common names of these edible mushrooms in the region. Speaking with the Indians in the forests or in the markets about these mushrooms is like receiving a class of how to know, use, and identify the species.

Among the most common and important edible mushrooms, both in Mexico and Guatemala are *Agaricus campestris*, *Amanita caesarea*-complex (formed by *A. caesarea* s. str., *A. basii*, *A. jacksonii*, *A. laurae*, *A. tecomate*, *A. tullossii* and *A. yema*), *Boletus edulis* group (e.g., *B. edulis*, *B. aestivalis*, *B. pinophilus*), *Cantharellus cibarius*, *Clitocybe gibba*, *Helvella crispa*, *Hypomyces lactifluorum*, *Lactarius deliciosus* group (as *L. salmonicolor*), *L. indigo*, *Morchella esculenta* group (as *M. costata* and *M. elata*), *Pleurotus djamor*, *P. levis*, *P. opuntiae*, *P. smithii*, *Ramaria flava*, *Russula brevipes*, *R. cyanoxantha*, *R. olivacea*, *Suillus brevipes*, and *Tricholoma magnivelare*. All of them are sold in the popular markets.

Some of the edible species are eaten not only for dietary needs, but also for additional health effects. The mentioned species of *Pleurotus*, as well as species of *Clitocybe* and *Lactarius*, are used for both purposes. For instance, *Clitocybe gibba* is used to reduce fever, and *Lactarius indigo* as a purgative. The delicious *Ustilago maydis* (Fig. 1) is used against erysipelas and grains or spots.

Many traditional beverages made by fermenting corn or several fruits are used by the Indians as a food or for medicinal purposes. Among these beverages “pozol,” “indigenous beer,” “chicha,” “pulque,” “tejuino,” and others are very important. These beverages are slightly alcoholic, and are formed by several yeasts and molds, such as species of *Candida*, *Hansenula*, and *Saccha-*

romyces yeasts, and *Alternaria*, *Aspergillus*, *Cladosporium*, *Fusarium*, *Kloeckera*, *Mucor*, *Paezilomyces*, *Rhizopus*, and others (Ulloa, 1974; Ulloa et al., 1987b; Guzmán, 1997).

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