Indigenous Concepts of Medicinal Plants in Oaxaca, Mexico: Lowland Mixe Plant Classification Based on Organoleptic Characteristics*1

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Summary

For the Lowland Mixe of Oaxaca (Mexico), plants are a central part of their medical system. Direct access to the natural environment is not among other possibilities - made feasible by sensory perceptions of plants and plant products. This is interpreted according to cultural expectations. The Mixe judge uses of a plant based on its characteristic smell and taste. These are used in the decision process on whether a plant may be a potential medicinal and for which particular illness it may be used. Generally, antirheumatic drugs (especially the bark of various trees) are valued to treat diarrhea and dysentery, whereas bitter plants being used as supplementary therapy for these indications. Bitter, aromatic and aromatic-bitter plants are valued in the treatment of gastrointestinal cramps and pain. Cough and other respiratory complaints are treated mostly with sweet, sometimes sour drugs. This form of perception is central to the Mixe's medicinal plant concepts while the classification based on the humoral 'hot/cold' dichotomy is of minor importance. Taste and smell properties thus open natural resources to human use. Cultural interpretations of the therapeutic results achieved with these plants are additional criteria for deciding whether the use of a specific plant should be continued and for changes in its use profile.

Introduction

For the Lowland Mixe of Oaxaca (Mexico), plants are a central part of their medical system. Plants are valued as an immediate treatment, for example for minor injuries or as soon as a skin infection is noticed. Plants also are an important part of the treatment for a large number of systemic illnesses. Our concern for these plants stems from an interest in their pharmacological effects and on bioactive compounds from these plants (Borx et al., 1997; Heinrich et al., 1992; Kuhn et al., 1995; Hör et al., 1995), but also from the anthropological questions that arise from the traditional use of such plants (Etxon, 1988, 1994; Heinrich, 1994, 1997). We try to understand how cultural interpretations of the biological effects of plants and the effects observable in experimental studies interrelate (Heinrich, 1996; Borx et al., 1997). We are interested not only in how a certain culture uses plants as medicines or only in phytochemical and biological-pharmaceutical studies on plants, but in a truly multidisciplinary approach combining anthropological and biocological-pharmaceutical concepts and methods.

Medical monographs and community practices have been appearing in the last decade (for example, Casillas R., 1990; Greifeld, 1983; Dow, 1986). Of continuing interest is the history of the indigenous medical systems (Tiezca T., 1986; Lopez P., 1992). Several studies focus on the efficacy of indigenous forms of treatment (Anderson, 1992; Brown, 1988, and references cited) and on the potential side effects of such treatment (Trotter, 1985). Studies on culture bound illnesses (folk illnesses), which started with the early work of Arthur Rubel in the late fifties and early sixties, are still an important focus of research (Rubel et al., 1985). Of particular interest for our studies is the anthropological research on infectious illnesses prevalent in Mexico and adjacent countries (Burleigh et al., 1990; Heinrich, 1994), but this field still remains to be more fully explored. Recent interest has also focused on patients' and doctors' roles and expectations in clinical settings (Finkel, 1994; Houn, 1994), on other aspects of urban Mexican medicine (for example, Calva, 1996) and on the specific role of women as patients and as health care providers (Finkel, 1994; Parra, 1993). The field of ethnobotany is flourishing with many of the studies being contributed by Mexican researchers (Aguilar et al., 1994, Berlin and Berlin, 1996; Bye and Linares, 1987; Casas et al., 1994). Comparatively little is known about the relative role of plant based remedies as compared to commercially available pharmaceuticals and on other aspects of pharmaceutical anthropology (van der Geest et al., 1996; Calva, 1996). In the study of the cultural basis of indigenous plant use there have been two main approaches. One line of thought is the cognitive approach exemplified by Berlin (1992), looking at plants in general from an ethnocognitive perspective. With such an approach one gets an understanding of the cultural structuring of the natural environment. The other well known concept in medical anthropology holds that the basic classificatory system in most regions of the Americas is the 'hot/cold' system (Foster, 1994, and references cited in this work). During the fieldwork with the Lowland Mixe I came to realize that this system is only of minor importance with this group. Instead direct access to the natural environment is usually made feasible by sensory perceptions of plants and plant products. Taste, smell and/or the irritating effect produced by some plants (especially the sap) are thus the basic criteria to decide if a plant may be considered medicinal and for which illness it may be used. While visual and to a lesser degree acoustic perceptions have been discussed in greater detail (Howes, 1991; Stoller, 1989), taste and smell have received some attention only in the last few years (Logan and Etxon, 1994). They are for example not included in a recent volume on the relationship between humans and nature by Ellen and Fukui (1996): On the other hand, the role of olfactory remediation has received renewed attention in medicine and psychology (Clasen et al., 1994; Martín, 1996).

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In order to differentiate between hot and cold in the context of humoral medical concepts and other hot/cold-concepts the former ones are put in quotation marks ("...").
classifier systems are discussed. While I draw chiefly on our data on the sensory perceptions of medicinal plants, I will also briefly discuss concepts associated with illnesses and with foods.

The land of the Mixe extends mostly through the cool and humid mountains of the Sierra de Juarez in the Mexican state of Oaxaca. San Juan Guichicovi being the only Mixe-speaking community belonging to the subtropical Isthmus of Tehuantepec. San Juan is the principal community (cabecera) of a subdistrict (municipio) of the same name. In 1980, 20,000 persons were living in the municipio, approximately 5,500 to 6,500 of them in the cabecera (Censo General, 1980: 145-146 and unpublished data). Seventy-five percent of the population in the cabecera is considered to be bilingual. A minute fraction of the population speaks only Spanish. The economy is based on subsistence agriculture (chiefly maize) and on the production of coffee and citrus fruit. Another relevant commercial product are huipiles (women’s blouses) of the Tehuantepec style. They are produced by women and men in the community and are mostly sold to Isthmus Zapotec merchant women who sell these products in numerous communities of the Oaxacan part of the Isthmus and in many other regions of Mexico. No detailed monograph on the lowland Mixe is available. Brief accounts are given by Foster (1969) and Nahmad (1965). The only cultural aspects that have been dealt with in detail are the ritual calendar, still used in some parts of the municipio (Carrasco et al., 1961; Lipp, 1991; Wittlauer and Wittlauer, 1963) and in some adjoining municipios - the relationship of religious ritual and medical concepts (Lipp, 1991).

Mixe belongs to the macro-Mayan stock. No monograph on the ethnobotanicals of Lowland Mixe is available. Vowels are generally pronounced as in Spanish. Additionally [e] is used, which is pronounced as a nasalized Spanish [o]. The consonants are pronounced as in Spanish. A glottal stop [ʔ] and palatalized consonants and vowels are frequent (written as [ɔ], [ky], [my], etc.). In this article the Mixe words are transcribed as used by the bilingual teachers in the community.

There are at least 15 different healers (pa'am iṣepi) known in the community. The largest groups are "specialists in home remedies". Other important groups are midwives (ma suuk wixp'i or pataran), chupadores (pota'ak iṣepi or mu'isep - those who suck), prayer makers (rezaadores), espiritistas and espiritualistas. Fairly large differences exist between the various groups of healers.

The "specialists in home remedies" are a group of practitioners who do not consider themselves healers, but who "only give some plants or a limpia (ritual cleaning) if a person is ill. These persons are generally knowledgeable with respect to plants that can be used in the treatment of common, minor illnesses and ailments. Any person who has a 'cooling hand' (k'otok) is capable of performing a limpia. If an illness is more severe or difficult to treat, the patient may be referred to other healers especially to those who are ritual specialists. Midwives assist pregnant women, the women in labor and the mother and child in the first few postnatal weeks. Besides practicing empirical forms of

methods

The data presented here were collected during fieldwork in San Juan Guichicovi which took place over nearly two years. Most of the data on the sensory perceptions of medicinal plants presented here were collected during three shorter stays of 6 to 8 weeks between 1990 and 1994. Specialists in medicinal plants and/or healing rituals were interviewed, and excursions into the surroundings were made with them to collect the plants indicated as medicinal. For each plant detailed information on its uses, preparation, application and concepts associated with the plants was solicited. The healers were observed during their healing sessions and were also asked in open-ended interviews to describe the illnesses and their treatments. Unstructured interviews and informal discussion on medicinal plants or treatment methods were additionally conducted with a very large proportion of the population (see Heinrich, 1994). To elicit information on the topics of relevance in this paper the healers were routinely asked "Why is this plant a medicinal and why is it good for treating the illness you mentioned?". Voucher specimens were collected and identified by comparison with authentic specimens at the National Herbarium of Mexico (MEXU). Some difficult species were identified by specialists on the respective taxa. A complete set of specimens is available at the National Herbarium of Mexico (MEXU) and at the Institut für Pharmazeutische Biologie in Freiburg (Germany).

results

illness concepts

Of central importance to the Mixe is the question of the cause or causes of an illness (Heinrich, 1994). To the Mixe minor ailments, which are of relatively short duration, are of little concern. Such illnesses include superficial cuts and bruises and other minor dermatological conditions, cough and other respiratory illnesses. These diseases are thought to be

3 The original idea for the above mentioned symposium is based on parallel observations of John Brett and myself in different areas of Mexico. When I met John Brett in 1992 in Mexico City, and heard his talk at the 3rd International Congress of Ethnobiology, I was struck by similarities with respect to the sensory perceptions of medicinal plants between his description of the Tzeltal Maya and my own experience with the Lowland Mixe (Brett, 1992, 1994; Heinrich, Rimpler and Antonio B., 1992; Heinrich and Antonio B., 1993; Heinrich, 1994). We had both noted independently during fieldwork that certain chemosensory properties of plants define them as medicines and these properties give hints to their use in the treatment of certain illnesses. Since we had both worked autonomously (not knowing about the research of the other) in areas quite far apart in Mexico, the coincidence seemed to be more than an accidental 'exception to the established rules'.
caused by natural forces. Cuts, bruises, and burns need no further explanations, since the physical impact on the person is readily noted. In cases of colds, the coldness of the season (for example December), the lack of proper clothing, or 'una infección' (an infection, a Spanish loan word in Mixe) are considered as causative factors.

An example of an illness which requires, according to the Mixe, a more detailed understanding of the causes is tekeš'té (susto, 'sudden fright') known from many parts of the Americas. This illness is caused by a sudden fright, which may either weaken the person or cause the loss of his or her soul. Another example is tsú box xin tooy (the fever caused by the evil winds of the night). Evil spirits of the night enter the body and may cause severe harm. For many people supernatural beings were and still are of special importance to explain the causation of illnesses, and these beings require the performance of healing ceremonies (see HINRICH, 1994). These beings are part of the environment as it is perceived by the Mixe. There are powerful places around the village that are appropriate for performing certain healing rituals (especially rites associated with leaving old clothes), because they are associated with such beings. Central to all healing rituals are rites in the church or in front of the house altar.

In other cases direct physical causes are recognized by the Mixe: the heat of the rainy season and especially of the casicula (the short semi-dry season between the two major rainy periods) is seen as dangerous and may cause insolation (sunstroke). Spoiled food is also known as a cause of some gastrointestinal illnesses. The Mixe seek an explanation both for the why and how a person has been struck with illness, but the humoral 'hot/cold' classification is not employed in the interpretation and search for therapy. There may be one exception: Some people consider the corpse of a recently deceased person to be 'hot' (HINRICH, personal observation).

These concepts form the basis on which the Mixe develop treatment strategies for curing during an illness episode.

**Plants in the Mixe Environment**

Plants in general are divided into three important groups:

- useful and therefore deserving some sort of management,
- useless and harmless and,
- a small group of plants which are not considered useful and that are regarded as dangerous or obnoxious (for example Mucaja sp., Fabaceae, because of the itching sensation and the inflammation caused by the hair of the plant).

Within the first group, plants are assigned a large number of different uses, including food and medicine, in construction, as a toy for children, as shade trees and the like. As a consequence, such plants are often planted in home gardens, protected in the milpa (cornfield), spared from the cleaning of pathways and roads in the community (HINRICH and ANTONIO B., 1993), or even brought into the community from neighboring communities or from the markets of several cities that serve as points of exchange.

The distinction between the first and the second group of plants may be ambiguous in many cases. Some people consider a certain plant to be medicinal or use it as an infrequently employed food item (for example quichiles), while others regard the plant as useless. This is especially the case with respect to the numerous plants in the village. These grow along the paths and streets, on empty lots and spontaneously in yards (for example Eupitys mexicana Less., Asteraceae, Sida spp., Malvaceae, Leonturus japonicus L., Hypia verticillata Jacq., both Lamiaceae) and some of the plants may be kept by a few people who hold them to be medicinal while others do not spare them when weeding.

With respect to the distinction between the first (useful) and the third (dangerous) group of plants there are a few ambiguous examples, too. Croton soliman Cham. and Schlecht., C. panamensis (Klotzsch) Muell. Arg. and Hura polyandra Bailon (all Euphorbiaceae) are used as medicinals, but many informants also are afraid of the irritating sap produced by the plants.

In what follows I will concentrate on medicinal plants and only briefly refer to plants used in nutrition, a group which deserves a separate study.

**Medicinal Plants**

Medicinal plants that the Mixe regard as potentially helpful are sought as soon as the person affected notices, for example, an infection or a cut. No healers or ritual specialists are consulted in these cases. They are usually consulted only if supernatural causes are suspected or if the illness is either lasting or painful. Healers perform rites which are appropriate for a certain illness (for example a limpia [cleaning ceremony] for susto) and recommend the application of a herbal remedy (HINRICH, 1994). The species used have been described in detail elsewhere (HINRICH, 1989). A total of 213 plants with 299 different use categories were documented ethnologically and botanically and were identified to the species level. Plants are generally used in the treatment of minor illnesses such as cuts, skin infections etc. The largest group of plants is used for this purpose (72 species). Other important uses are for gastrointestinal conditions (66 species) and for illnesses associated with rise in body temperature (63 species).

Most plants cited as medicinals by the Mixe informants grow in the community or in its immediate surroundings (HINRICH and ANTONIO B., 1993) and cannot be considered as wild resources (ETIKIN, 1988). Most medicinal plants are therefore readily available if they are needed. In order to understand the indigenous criteria that are being used to characterize and select a medicinal plant I did not ask for specific concepts about a medicinal plant, but instead asked "why is this plant useful as medicine". Informants usually referred to properties of taste and smell of a plant and frequently asked me to taste, smell or otherwise try the plants. These properties are also referred to in discussions about the medicinal properties of a certain plant between people in the community. The Mixe distinguish a large number of organoleptic properties of the medicinal plants (Tab. 1). Odor and taste of a plant or its parts are the most important criteria for deciding against what illness a plant may be used.

To treat infections of the skin, plants with any of the qualities summarized in Tab. 1 are used, the only exception being pa'ak (sweet). Aromatic (cooling) plants are considered very useful to treat illnesses that are associated with fever (HINRICH, 1988) and are mostly applied externally (shower baths, use of liniments and massages using alcoholic preparations of plants). Astringent drugs (especially the bark of various trees) are valued to treat diarrhea and dysentery. Additionally, bitter plants are employed as a supplementary therapy for these indications. Bitter, aromatic and aromatic-bitter plants are valued in the treatment of gastrointestinal cramps and pain. Cough and other respiratory complaints are treated chiefly with sweet and sometimes with sour drugs. A special category is ax'je oot's. The foam that is formed if one rubs the mashed leaves of ax'je oot's aats [Gouania polygama (Jacq.) Urban, Rhamnaceae] is seen as a hint of its medicinal properties.

These qualities also guide the search for new medicinal plants. Some of the criteria listed in Tab. 2 are also sometimes used in discussions

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*In an earlier stage of fieldwork I had asked directly for the humoral qualities of a plant, but with the exception of some recently introduced plants such as Romeros (Rosmarinus officinalis L., Lamiaceae) - never got meaningful answers. The most frequent answers were 'Quien sabe' (who knows), 'Puede ser algo caliente' (it may be a little hot), or other answers that indicated a lack of understanding of these concepts on the part of the informants.*
Tab. 1: Quality of medicinal plants according to Mixe Indian criteria

<table>
<thead>
<tr>
<th>Quality</th>
<th>Mixe term</th>
<th>Example (plant part used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>aromatic (cooling)</td>
<td>xuwp</td>
<td>Siparuna andina (Tol) A. DC. (leaves), Montiniesicaceae</td>
</tr>
<tr>
<td>astringent</td>
<td>wi'ly</td>
<td>Guazuma ulmifolia Lam. (bark), Sterculiaceae</td>
</tr>
<tr>
<td>bitter</td>
<td>tu'em</td>
<td>Calea zucatechichi Schlecht. (leaves), Asteraceae</td>
</tr>
<tr>
<td>burning</td>
<td>tu'xyp</td>
<td>Hura polyantha Baillon (latex of fruit), Euphorbiaceae</td>
</tr>
<tr>
<td>foaming ('forms foam when rubbed')</td>
<td>sujiz oo'yr</td>
<td>Gouania polygama (Jacq.) Urban (leaves) Rhamnaceae</td>
</tr>
<tr>
<td>fresh (fresco)</td>
<td>nik*</td>
<td>Pefromia pellucida (L.) Kunth. (aerial parts), Piperaee.</td>
</tr>
<tr>
<td>gelatinous</td>
<td>u'ly</td>
<td>Heliocarpus donnell-smithii Rose (bark), Tilliaceae</td>
</tr>
<tr>
<td>hot (like chile)</td>
<td>jomancap</td>
<td>Capsicum frutescens L. (fruit), Solanaceae</td>
</tr>
<tr>
<td>hot (like onions)</td>
<td>jajp</td>
<td>Allium cepa L. (onions), Alliaceae</td>
</tr>
<tr>
<td>sour</td>
<td>sun</td>
<td>Citrus limon (L.) Burm (fruit), Rutaceae</td>
</tr>
<tr>
<td>sweet</td>
<td>pu'ok</td>
<td>Pyila scaberrima (A. L. Juss) Moldenke (leaves), Verbenaceae</td>
</tr>
</tbody>
</table>

- Also humid, in this context the term refers to a plant which contains large quantities of sap (for example in the stem or in the leaves).

Tab. 2: Hot and cold categories in Mixe from San Juan Guichicovi

<table>
<thead>
<tr>
<th>Categories</th>
<th>Mixe term</th>
</tr>
</thead>
<tbody>
<tr>
<td>hot (caliente)</td>
<td>uam</td>
</tr>
<tr>
<td>warm (tibio)</td>
<td>jokk</td>
</tr>
<tr>
<td>fresh (fresco)</td>
<td>nik</td>
</tr>
<tr>
<td>cold (frio, weather, an object)</td>
<td>titik</td>
</tr>
</tbody>
</table>

- Also green, used for example if one refers to an animal, that died recently

The Selection of Medicinal Plants

According to John (1990) the "process by which humans first came to use these economic plants and to avoid others has been lost in history". But there are two instances where one can still observe the criteria for selecting herbal remedies: the introduction of new plants to an area and the ways people get acquainted with hitherto unknown native medicinal plants.

During my initial fieldwork (1985/86) in San Juan Guichicovi one of the healers introduced a plant which he came to know through healers from the highlands: Bryophyllum radulatum ssp. macrophyllum (DC.) R.R. John (Asteraceae) or tapalhuelo. The plant was subsequently used to treat ataques (various illnesses associated with seizures of the whole body). There seemed to be no taste or smell property that made the plant of particular interest as a medicine. The essential point was the experience other healers from the highlands had with this plant. The plant was therefore grown in his house garden and a few plants later grew in disturbed areas of the community. Interestingly, the use of this plant has since been discontinued and the plant is no longer propagated in the area.

Uses as a purgative are reported for Hura polyantha Baillon (jabilla, a tree from the Euphorbiaceae) from many parts of Mexico. A single tree was introduced into the community around the turn of the century by a Zapotec trader. The sap of this tree was a good substitute for purgatives known at this time and has very strong physiological effects. It is considered to be jaip (hot like chile) and xun (sour). I was unable to confirm whether these properties were of any importance in the initial selection of medicinal plants. The plant is now being replaced by magnesium hydroxide. The hard fruits are still used occasionally for wheels of little carts made by boys. These two examples illustrate the importance of experiences people outside the community had with a certain plant in the selection of culturally new medicinal plants and show the dynamics of plant use.

Another example is the shrub Rustea serrulata Jacq. (Anemates, Scrophulariaceae). The plant was formerly used to treat malaria and gastrointestinal illnesses. The use seemed to be fairly common several decades ago. When I showed this plant to a middle-aged informant he stated that he did not know it as a medicinal and then went on to try it. Because of the intensely bitters flavor of the leaves he commented that the plant might be good for treating fever. Other examples corroborate the idea that such qualities are of importance for making an initial decision on potential uses of a plant including plants with astringent, aromatic or bitter properties. I have observed several other cases where
unknown plants were judged based on their taste and smell properties, especially for bitter, astringent, and aromatic plants. Thus there are two relevant ways of becoming acquainted with new medications: the experience of other people, which is adopted, and the exploration of unknown plants, especially based on their taste and smell properties.

**Food**

Generally there is no clear concept of a humorally balanced food. The main focus is on the alternative between 'heavy food' (such as meat) and food that is easier to digest. With respect to plants four concepts are frequently used to describe them: sweet, sour, hot like chilli, or hot like onion (see Tab. 1). Good food is neither extremely sweet nor extremely sour, but has a mild taste. But it may be rather spicy. There seem to be no elaborate dietary restrictions, for example for pregnant women and ill persons.

**Discussion**

Taste and smell provide a direct link between nature and culture and thus allow, for example, the selection of a certain medicinal plant by the lowland Mixe. These organoleptic properties therefore are the link between illnesses as they are perceived culturally and the naturally available medicines. A plant is used and as a result of a continuous evaluation it may be used for longer periods of time or become obsolete as a medicine. Thus, the organoleptic properties open the door for a plant's use, but the continuing use depends on the cultural interpretations of the therapeutic results obtained with the plant. The taste and smell properties accordingly allow the structuring of the botanical environment (compare Johns, 1990, for taste properties of food plants). The medicinal flora is thus composed of discontinuous sets of plants, each individual one with properties taken from a limited set of organoleptic alternatives. Based on these properties plants have a certain use value. But taste and smell are not the only criteria used in the initial selection of medicinal plants. The experience of people in other regions may be as important.

Translations of the Mixe terms are used in this paper, but I am aware that a detailed cognitive study of these concepts will still be necessary in order to better understand the delimitations of these concepts.

One of the interesting theoretical results of these data is that they corroborate Moerman's (1996, 1997) proposal that plants are not selected at random, but that there exist criteria for the selection of certain taxa and for rejecting others. Among the families most frequently used in North America are several which are phytochemically well known for being rich in essential oil and/or in bitter compounds and which have yielded medicinal plants used in numerous cultures (for example Lamiaceae, Asteraceae). Such families are widely used among the lowland Mixe, too.

Two indigenous concepts merit additional discussion on a cross-cultural basis: The concepts of astigmatism and bitterness. While there is no concise cross-cultural overview of the reasons for the use of a certain medicinal plant or groups of plants available, uses of astringent (or tannin-containing) plants are particularly important in the treatment of diarrhea and dysentery, while bitter remedies are favored for stomach-aches and fever. There may be a third group of plants with a particularly important use: aromatic-sweet ones. Such plants may be of relevance cross-culturally in the treatment of respiratory illnesses. These two or possibly three correlations may have to do with observations made for centuries that such groups of compounds are effective in the treatment of the illnesses mentioned. A detailed cross-cultural analysis of ethnographic data on these concepts may help us to gain a better understanding of how people perceive plants and their properties.

**Conclusions**

While there have been a few indications that chemosensory properties of medicinal plants are of importance to indigenous groups of Mesoamerica (see Messier, 1991; Ortiz de Montellano and Browner, 1985; Logan and Dixon, 1994), the data on the lowland Mixe are clearly contradictory to the common concept of medicinal plant classification especially in the Americas based on the 'hot/cold' concept. It is intrinsically difficult to prove that a cultural concept does not exist in a region, but the data from the lowland Mixe indicate that taste and smell properties are far more important than the 'hot/cold' concept. I expect that one of the reasons for our lack of appreciation of taste and smell concepts is the relatively undervalued role of these properties in European-based cultures. Two exceptions are the concepts of 'sweet' and 'bitter', which are used to separate the pleasant from the medicinal or food from non-food.

For the Mixe there also is no common association between illnesses and humoral 'hot/cold' concepts. There are illnesses that are regarded as hot, but this generally refers to their thermal properties. Examples are fever and some forms of dermatological infections. Humoral concepts may well become of increasing importance due to the increased contact of the healers and other persons with outsiders (for example during meetings of native medical practitioners from other parts of Mexico organized by the Instituto Nacional Indigenista).

There are many cases of a classificatory system based on humoral traditions (for example López A., 1980; Foster, 1994; Frei et al., 1998); it is essential for future fieldwork in South and Mesoamerica not to limit the research to the 'hot/cold' system. It will be of interest to look at the development of classificatory systems during larger time periods to observe changes in the systems. Data such as those presented here help us (as pharmaceutical biologists) to better understand indigenous concepts of medicinal plants and are important guides for our selection of plants for further evaluating the native pharmacopoeia. As an anthropologist, I am fascinated by the cultural structuring of the botanical environment using pharmacobotanical and chemical concepts, I think it will be rewarding to look simultaneously at the interface between human beings and their botanical resources from a pharmacological, botanico-chemical, and anthropological perspective.

**Acknowledgement**

This research would not have been possible without the collaboration of the healers, midwives, and other inhabitants of San Juan Guichico, who are the traditional keepers of this knowledge. I am particularly grateful to Don Abelardo Ascona and Doña Clafida Figueroa, their family and to Maestro Erazto Gonzalez. The botanical identification at MEXU was performed in collaboration with the specialists of this institution. I would like to thank particularly P. Davila, T. Ramamoorthy, Fr. Ramos, R. Torres, O. Telliez and J.L. Villasotetor.

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**Zusammenfassung**

Indigene Vorstellungen über Arzneipflanzen in Oaxaca, Mexiko: Pflanzenklassifikation der Tieflandmische auf der Grundlage organoleptischer Charakteristika

Für die Tieflandmische in Oaxaca (Mexiko) sind Pflanzen ein zentraler Teil ihres Medizinssystems. Ein direkter Zugang zur natürlichen Umgebung ist - neben anderen Möglichkeiten - durch sensorische Wahr-

References


Indigenous concepts of medicinal plants


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