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Medicinal and Food Plants: Isthmus Sierra Zapotec Criteria for Selection*¹

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Summary

The Zapotec inhabitants of the Sierra de Juarez foothills in Oaxaca (Mexico) live in an area of great biological diversity. As farmers (*campesinos*), and occasional gatherers, hunters, and fishermen Zapotecs have a deep relationship with, and detailed knowledge of, their natural environment. Consequently, in daily subsistence and in response to illness, plants play major roles. This paper examines cultural criteria applied by the Sierra Zapotecs for selecting plants as food and/or medicine. These criteria are based on binary forms of classification. While the "hot"/"cold" dichotomy is dominant, other opposing systems exist, such as *amargo/simple* (bitter/neutral). Whether a plant is regarded as *frio* ("cold"), *caliente* ("hot") or (in some rare cases) *templado* ("temperate") depends mainly on one of the following criteria: habitat and/or the season of growth and collection, analogy in appearance to aspects of the illness being treated or features associated with well-being (doctrine of signatures), and taste and smell properties. Criteria for plant selection are not based on a single classificatory system, but are an integration of several. A comparison with ethnobotanical data from neighboring Mixe clearly showed differences due to cultural background.

Introduction

Inhabitants of the Sierra de Juarez foothills in Oaxaca (Mexico) live in an area of great botanic diversity. As farmers, occasional gatherers, hunters, and fishermen the Zapotec have an intimate relationship with, and detailed knowledge of, their natural environment. In daily subsistence and in response to illness, plants play major roles. Historically and to the present, selection guided by cultural criteria, empiricism and special needs has led to their native diet and their traditional pharmacopoeia. All plant use depends on social and cultural factors. While diet additionally depends on factors such as climate, biodiversity and nutritional needs (for calories, vitamins, trace elements), medicinal plants become culturally important due to demonstrated medical efficacy (as perceived in a specific culture). A number of studies in medical ethnobotany demonstrate that traditional herbal curing is often effective (ETKIN, 1994; ETKIN and ROSS, 1982; FOSTER, 1984a, 1985; HEINRICH, 1989; JOHNS, 1990; MESSER, 1991; ORTIZ DE MONTELLANO, 1986), and show that plant selection in native pharmacopoeias is not a random process, often with emphasis on certain botanical families (MOERMAN, 1979, 1996).

Our scientific interest in these medicinal plants is twofold and interrelated: First, we try to understand as fully as possible the classi-

fication of plants, their use, and the traditional way of conceptualizing and reasoning in Zapotec cosmic vision concerning food and medicine (see below); secondly, we study the pharmacological effects of indigenous medicinal plants and isolate new bioactive compounds.

This paper focuses on the cultural criteria applied by the Sierra Zapotecs for selecting plants as food and/or medicine. Criteria are not based on a single classificatory system, but represent the integration of several systems. While the "hot"/"cold" dichotomy² is dominant, other dichotomous systems exist, as well as selection based on physicochemical properties of the plant. Some important causes of illness as they are perceived by the Zapotec, and the indigenous methods for diagnosis are also discussed in this paper. A comparison with ethnobotanical data of a neighboring Mixe group (HEINRICH, 1989; 1997) clearly shows differences due to cultural background.

Ethnographic Background

The Zapotec are the most numerous group in the state of Oaxaca, Mexico. Historically, Zapotecs settled in the highland Valley of Oaxaca. Forced by Aztec and Mixtec invasions, some groups moved to the Isthmus of Tehuantepec in the middle of the 14th century (CAMPELL et al., 1993). This geographic dislocation was a major cause of different cultural and linguistic development. This paper deals with the inhabitants of the foothills of the Sierra Madre del Norte, precisely, with four isolated communities, the so-called Isthmus Sierra Zapotecs. Fieldwork in the communities of Santo Domingo Petapa and Santa Maria Petapa, as well as Santa Maria Guienagati and Guevea de Humboldt was conducted between January 1992 and March 1993, and in October and November of 1994. The Petapa communities border on the Mixe speaking community of San Juan Guichicovi (HEINRICH, 1989).

One to 5% of all inhabitants older than 5 years of age are Zapotec monolinguals, 50 to 70% are bilingual Indians and there are a considerable number of mestizos (ladinoized Zapotecs) in some locations (INEGI, 1993). Today many inhabitants have migrated to, or have seasonal jobs in other parts of Mexico, but agriculture, especially maize, coffee, and citrus fruit, is still the basis of subsistence for most families.

According to linguistic classification, Zapotec belongs to the Otomanguean family (JOSSELAND et al., 1984). Six closely related languages or dialects are recognized (NADER, 1976). The dialect spoken by Zapotecs living in the foothills is most closely related to the "Valle" dialect of highland Oaxaca, but due to its geographical isolation for the last 600 years and their proximity to the Isthmus Zapotecs of the region of Juchitán and Tehuantepec, there are a large number of derived features in their speech. Vowels and consonants are generally pronounced as in Spanish. In the following discussion, Zapotec is transcribed as used by the bilingual teachers of Santo Domingo Petapa.

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² In order to differentiate between hot and cold in the context of humoral medical concepts and other hot-cold concepts (for example, temperature), the former are put in quotation marks.

Methods

The data presented in this paper were collected in 1992 and 1993 (15 months) as well as 1994 (2 months) mainly in the villages of Santo Domingo Petapa and Santa María Petapa and during several short stays in Santa María Guienagati and Guevea de Humboldt. The information is based on open and structured interviews with local specialists, such as traditional healers and midwives. Observation and participation in the healers daily work (plant collection, preparation, and healing sessions) yielded further information (FREI et al., n.d.). Additionally a large part of the population (farmers, housewives, children, old people) was interviewed on popular use, treatment, and beliefs about medicinal plants.

To collect plant material, excursions were made with the informants to the different vegetation zones of the subdistrict (**municipio**). Detailed documentation about location, use, preparation, application, and healing concepts were obtained (MARTIN, 1995). Voucher specimens were collected, identified and complete documented sets are deposited in the following herbaria: México, D.F., Mexico (MEXU), Institute of Pharmaceutical Biology, Freiburg, Germany, and Botanical Garden, Zürich, Switzerland (ZT).

Results

Classification and Medicinal Plants

As **campesinos** (farmers) the Zapotec have a deep relationship with, and detailed knowledge of, their natural environment. In daily subsistence and in response to illness, plants always have and will continue to play a major role. To cite one of the informants, Doña Crisofora: "Todas las plantas que huelen, o que tienen goma y leche, todas sirven para curar. Las que tienen forma diferente o un color bonito sirven también; no más de algunos todavía no sabemos para que enfermedad, pero nos dice que podemos ocuparlas!" (All plants which smell or which have gum or milk sap, all of them are medicine. Those [plants] with a special form or color are also medicinal, but we still do not know all of them and what illness to cure with them, but they tell us that we could use them [translation by first author]).

This statement from the **curandera** and **partera** (healer and midwife) expresses one major aspect of classifying and selecting plants in Sierra Zapotec society. The central aspects of Zapotec classification and selection clearly appear to be dichotomies and are based on perception and conceptualization. **Naj'lej'**, "hot", and **naj'galaj'**, "cold", play dominant roles. **Nala'aj'**, bitter, and **nababa**, neutral, are two other frequently mentioned aspects. Classification is further based on metaphoric terms concerning culturally defined expectations. Whether one of these systems is built upon the others or if they exist in parallel with similar importance is discussed below.

Healing and food preparation in this region are largely based upon the principle of opposites, the humoral theory (FOSTER, 1988). While "cold" medicinal plants are chosen to cure "hot" illnesses and vice versa, food plants must have either a balanced composition or a compensating effect for "hot"/hot and "cold"/cold exposure in the course of daily life. The determination of a plant or a plant part as **frio** ("cold") or **caliente** ("hot"), in some rare cases **templado** ("temperate"), depends on the following three criteria:

First, habitat and/or season and time of day of growth or collection; second, analogy in appearance to some aspects of the illness being treated or features associated with well-being (doctrine of signature); and third, on taste and smell properties. While the first of these criteria is only used to classify a plant as "hot", "cold" or "temperate", the second and third are used as separate and independent classifications. Following is a more detailed discussion of these three criteria.

Habitat refers to the characteristics of the places where a certain plant species typically grows. *Xanthosoma robustum* Schott (Araceae), in Zapotec called **biu'luj'**, has its ecological optimum in shady, humid

places, close to rivers. Therefore Zapotecs believe this plant has "cold" properties. **Hua'a** (*Piper auritum* Kunth, Piperaceae), on the other hand, grows, as the Zapotec informants explain, **en el sol**, exposed to a lot of direct sunlight, and **guiere** (*Pinus oocarpa* Schiede, Pinaceae), which grows on the dry and sunny hills, are "hot" plants.

If the plant is flowering in the humid but also hot rainy season it is a "cold" medicine because of the "cold" properties of water. The different stages of the moon indicate to the healer whether to collect a plant or not, because of the different degrees of "coldness" of the moon. It is also important to collect bark on the side where the tree is exposed to the sun in order to get the more powerful "hot" medicine. As these examples show, humoral and temperature aspects are not always strictly separated. Prepared medicine is often to be kept overnight in the **sereno** - right under the roof - to collect the power of the freshness of the night for a "cold" preparation.

Analogy, or doctrine of signatures, concerns some aspect of the illness being treated or features associated with well-being which may relate to either color, form or texture.

Guixa'a riene (*Lantana camara* L., Verbenaceae), literally "flower of blood", has red petals and is used to cure all kinds of hemorrhages (menstrual, of the nose, etc.). Blood is classified "hot", but the cause of hemorrhage is usually "cold", so the red "hot" plant will cure the illness. **Tulipan duendi** (*Malvaviscus arboreus* Cav., Malvaceae) with its red, fire-like, "hot" flower is used to prepare a syrup against "cold" cough. The inflorescence of **guixa'a cancer** (*Tournefortia densiflora* Mat. & Gal., Boraginaceae) shows the form of the ovarian tubes and indicates to a midwife its power in curing female illness like inflammation and infertility. **Mango** (a Spanish loan word, *Mangifera indica* L., Anacardiaceae) produces a reddish "hot" sap when its bark is injured. Zapotecs treat the "cold" type of diarrhea with this sap.

Taste and smell can indicate whether a plant is "hot" or "cold". But often these are also used as direct descriptions and classifications.

Smell: Usually, strong smelling aromatic plants are classified as "hot" and considered valuable in cases of **aire**, a "cold" illness caused by supernatural winds which mainly cause pain and swelling.

Taste: **Amargo/simple**, bitter/neutral or in Zapotec **naj'laj'/nababa** (see Tab. 1), seems to be another dichotomous system in addition to "hot"/"cold". It is similar to the Mixe system of classification (HEINRICH, 1994). Bitter plants are used in the treatment of gastrointestinal illnesses and for abortion and childbirth. Astringent plants are applied to treat diarrhea and dysentery. Sour drugs are employed to cure respiratory ailments. Some of these applications are comparable to uses of plants which have similar properties and which are included in European pharmacopoeias (for example, Pharmacopoeia Helvetica VII). Several phytochemical components of these Zapotec plants have been isolated, and various biological and pharmacological activities have been demonstrated through *in vitro* and *in vivo* tests.

There is some evidence that **amargo** (bitter) corresponds with "cold" and **simple** (neutral) with "hot", because the terms are often given at the same time in the same combination. If the "hot"/"cold" classification is not used, the second most frequently mentioned system of classification is **amargo** or **simple**. This usage may also indicate the existence of an independent system on its own. Additional data are required to substantiate this idea. The properties of medicinal plants are summarized in Tab. 1.

There also exist many intermediate stages such as **agriodulce**, sweet-and-sour or modifications of the basic terms such as **muy picoso**, very hot/spicy.

As stated by HEINRICH (1998) with respect to the Mixe, the Zapotecs also want to see or feel the effect on the human body of the plant applied, so-called culturally defined expectations. A physiological effect is believed to be the first step toward recovery. This may be sweating, diarrhea, forced flow of urine, vomiting, aching, or flushing. But also visible transformation of the applied plant material during treatment

Tab. 1: Qualities of Zapotec medicinal and food plants

Zapotec	Spanish	English	Plant
naj'le'ej'	caliente	"hot"	<i>Malvaviscus arboreus</i> Cav. (Malvaceae)
nagaaj'la'aj'	frio	"cold"	<i>Xanthosoma robustum</i> Schott (Araceae)
nala'aj'	amargo	bitter	<i>Artemisia ludoviciana</i> ssp. <i>mexicana</i> Nutt. (Asteraceae)
digapahuaj dibectij/n	simple	tasteless/neutral	<i>Mirabilis jalapa</i> L. (Nyctaginaceae)
naj'shieij lindahuaj	huele bonito	smells nice, aromatic	<i>Cymbopogon citratus</i> (DC.) Stapf (Cyperaceae)
rala'a fieruhuj	huelo feo	smells bad	<i>Chromolaena collina</i> (DC.) R.M. King & H. Rob. (Asteraceae)
nij	agrio, acido	sour/acid	<i>Hibiscus sabdariffa</i> L. (Malvaceae)
nabara'a	"estitico"/astringente	astringent	<i>Mimosa tenuiflora</i> (Willd.) Poir. (Mimosaceae)
naruchu'u	resbaloso	slimy	<i>Zebrina pendula</i> Schnizl. (Commelinaceae)
naya'naj	picoso	hot/spicy (like chile)	<i>Capsicum baccatum</i> L. (Solanaceae)
na'aj''xi'	dulce	sweet	<i>Lippia nodiflora</i> (L.) Greene (Verbenaceae)
guguegue'	quemoso	burning	<i>Argemone mexicana</i> Sw. (Papaveraceae)
gugue nadii	baboso	sticky	<i>Plumeria rubra</i> L. (Apocynaceae)
gudedisejdxu'u	salado	salty	<i>Gonolobus</i> aff. <i>barbatus</i> Knuth (Asclepiadaceae)
rej'abadorana	seco	dry	<i>Jatropha curcas</i> L. (Euphorbiaceae)
bedxij'na'ahuaj	espumoso	foaming	<i>Enterolobium cyclocarpum</i> (Jacq.) Griseb. (Mimosaceae)
*alcanforado	alcanforado	camphoric	<i>Tugetes lucida</i> Cav. (Asteraceae)

(*No Zapotec expression could be elucidated; loan word from Spanish.)

indicates effectiveness. According to indigenous interpretation a "hot" illness will burn the "cold" plant by changing the color from green to black or by changing their nice smell into a bad one.

All these examples probably give the impression that there must be a strict rule to classify all plants and diseases into either "hot" or "cold" or some other opposing systems, and the term once given will always be connected with this particular plant. MOLONY (1975) suggested in her work from a Spanish-Zapotec community in Oaxaca that peasants apply a stereotypic code for determining relevance of food plants. Following such a code for each patient and situation, an individual explanation will meet Zapotec expectations and cosmovision. In the case of the Isthmus Sierra Zapotecs the code would be the three criteria discussed above. The approach used by Molony is surely more valid than the approach still encountered in many ethnobotanical studies of making lists of plants with allegedly precisely defined uses and properties. The cure must change depending on the type of illness, its humoral classification in a certain situation and its causes. Several illnesses can be "cold" or "hot". The plants themselves can also be divided into various categories according to a variety of factors mentioned above. Not only is the plant as a whole classified, but also the plant parts can be divided into different sections with special properties:

- roots are usually considered to be "hot" because they are not exposed to the "cold"/cold winds (*mal aire*) of the night and grow in the "hot"/hot ground.
- leaves are "cold", because they are exposed to winds.
- twigs: if they are green they are not as strong as red ones, which are considered "hot" (for example, *Chenopodium ambrosioides* L.; Chenopodiaceae)

- flowers can be "hot" or "cold", depending on their stage of maturity or their color.
- gums and milky sap are usually "cold".

Plants recently introduced at regional meetings of healers or through travel are rapidly classified without apparent doubt. This flexibility also helps explain the process of selecting new plants and learning from other healers as an ongoing process based on the three criteria described above. Finally, dreams may play an important role in plant selection for some healers.

Classification and Food Plants

Medicinal plants are taken to restore a highly imbalanced body and to alter conditions in one distinct direction. Food plants, on the other hand, should be consumed as balanced compositions, or should have compensating effects for the usually slighter "hot" or "cold" exposure in the course of daily life. Food can cause illness if it is not eaten at a proper time. "Cold"/cold water instead of "hot"/hot coffee in the early morning will affect the "hot" body which has just awakened. Cold soft drinks in the evening after "hot" work will weaken the body. Waiting past the usual hours of the meals is bad too, as every excess causes imbalance. The taste and smell properties applied to medicinal plants are used in a similar fashion to categorize food plants (Tab. 1).

Illnesses

Indigenous medicine always tries to explain the causes of illness as does western medicine. While allopathic medicine may interpret many

smaller or grave symptoms easily as arising from distinct etiological causes, traditional Zapotec medicine conceives various symptoms as resulting from one of a small group of five main causes. These causes are frequently seen as the illness itself (Tab. 2)

Tab. 2: Main causes of illness in Zapotec medicine

Zapotec	Spanish	English
dziechi	susto	sudden fright
stu	verguenza	shame
guelereza'ga'	cansancio	fatigue
gucleraaj'qui	daño de la comida / empacho	food
*golpe	golpe	physical and / or supernatural blow

(*No Zapotec expression could be elucidated; loan word from Spanish.)

All these illnesses can be caused by "cold"/cold or "hot"/hot influences and consequently are "cold" or "hot". There is no other classification of illness which corresponds to plant description as does the "hot"/"cold" system. Other descriptions such as color, texture, and sensory perceptions will be transcribed into "hot" and "cold" as well.

Illnesses can have various stages of "cold" and their intermediates such as very "cold", "cold", and not very "cold". The same variation is possible for "hot" and even "temperate". This is important because there are also different stages of gravity of an illness that have to be cured by the right plant and an accurate dose of the plant material. "Hot" cures are more dangerous and have to be applied with more caution. In "cold" cures one can employ a lot of plant material without danger.

Zapotec Reasoning of Causes and Symptoms ("Diagnosis")

"Diagnosis" is a term of western medicine and does not match exactly the Zapotec reasoning of causes and symptoms of an illness. This fact shows again that Zapotec concepts of illness are very complex and interrelated.

Usually *curanderos* (healers) do not ask many questions of the patient or his/her relatives. They look at the sick person, check his eyes, pulse, feel the temperature and tension of the muscles in different regions of the body, and soon start the healing rituals. These are similar for different illnesses; only - and this is essential for our ethnopharmacological studies the plant species and amount is varied. The recommendation at the end concerning food, medicine to apply at home, and behavior, is individual and often based on "hot"/"cold" principles. Water, a central aspect in the Zapotec cosmic vision as it is in several South- and Mesoamerican religions, is a "cold" principle and opposite to the more dangerous "hot" medicine. How one interacts with water influences the progress of a disease. The affected person is not allowed to take a bath or to eat "cold" food for three days after a treatment with very "hot" medicine.

Discussion

Classification criteria for plants in Sierra Zapotec society are not based on a single system, but are the integration of several complementary systems. While the "hot"/"cold"/"temperate" aspect is dominant, there

exist on a "lower" level other dichotomous systems as well as approaches based on sensory perception and observation. Where possible such second-place criteria will frequently be translated into "hot" and "cold" concepts. Classification rooted in perception or observation is never translated into "temperate". This indicates, as suggested by FOSTER (1984b), that the term temperate does not actually belong to the humoral system. Because in humoral terms, temperate illness would correspond to health and temperate medicinal plants have no effect on either "cold" or "hot" illnesses, it is rather an expression for not knowing the plant or its qualities.

In the last 60 years many papers have been published about whether humoral theory is either Prehispanic or fully adopted after the Spanish conquest. "Hot"/"cold" is a Spanish verbalization of part of the Zapotec cosmic vision. The Zapotecs had developed and worked out a widespread system of dichotomous reasoning in Prehispanic times (LOPEZ AUSTIN, 1980). We do not know this system and therefore a discussion of the origin of the Zapotec "hot"/"cold" concepts remains speculative. While Spanish-Mexican humoral theory as described by FOSTER (1994) mainly focuses on medicine, Zapotec dichotomous reasoning is omnipresent in the course of everyday life:

- to express seasons of the year,
- to describe segments of life,
- to distinguish between genders,
- to express religious traditions,
- to give definitions of the environment.

These and the data presented above, corroborate the importance of duality as the basic classificatory system. The suggestion by Foster that the humoral theory is the only valid framework in traditional medicine in Mesoamerica is not confirmed for the Isthmus Sierra Zapotecs.

It is interesting to examine data about Zapotec-Mixe and Mixe-Zapotec influences. It is astonishing that two distinct ethnic groups in a similar vegetation zone with common community borders do not correspond more in their medicinal systems. Why was there so little interchange? And why does this continue up to the present day? The main reason seems to be the different cultural backgrounds: Otomanguan versus Macro-Mayan linguistic roots, Highland Zapotec who migrated into the region from far away versus Lowland Mixe who had settled there earlier, and therefore dominant intruding Zapotecs versus displaced Mixe. Today there still exists an ongoing dispute about language. Mixe and Zapotec do not have common vocabulary and for communication Spanish is spoken. During inter-societal meetings of healers, there appears to be a general reluctance to speak in Spanish, the only common language; hence, exchange of ideas is limited. Additionally, the two communities have been enemies since the Zapotec invasion into Mixe land over five hundred years ago. Today the struggle continues over community borders and agricultural dominance. As for medicinal plants and their uses, there is a lot of correlation (HEINRICH and FREI, unpublished data), but the ways of reasoning about them are totally different. The main aspect in Mixe classification seems to be sensory perception (HEINRICH, 1998). On the other hand, Zapotec clearly have a dichotomous reasoning which is based - besides other criteria - on sensory perceptions (see above).

An astonishing correlation between our data and that of MESSER (1991) about systematic and medicinal reasoning in Mitla Highland Zapotec botany demonstrate again the importance of the cultural background for the construction of belief systems.

Future work in this field will be the comparison of data of ethnobotanical fieldwork among different Mexican ethnic groups (Mixe, Nahuatl, Maya, and Zapotec; by HEINRICH, WEIMANN, ANKLI, and FREI, unpublished data) in order to understand in greater detail the classification of plants and the medicinal system. We also try to trace

the pharmacological effects of indigenous medicinal plants and their phytochemical components, in order to better understand the biological and pharmacological effects of plants from these medicinal systems using ethnological and pharmaceutical studies. The results should upgrade the indigenous knowledge and present an easy and inexpensive possibility for providing appropriate and effective medicine to poor and remote areas.

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Zusammenfassung

Arznei- und Nahrungspflanzen: Auswahlkriterien der Isthmus Sierra Zapoteken

Die zapotekischen Einwohner der Gebirgsausläufer der *Sierra de Juarez* in Oaxaca (Mexiko) leben in einer Region großer biologischer Vielfalt. Als Ackerbauern und gelegentliche Sammler, Jäger und Fischer besitzen die Zapoteken eine tiefe Beziehung und eine detaillierte Kenntnis ihrer natürlichen Umgebung. Folglich spielen Pflanzen im täglichen Leben und in Antwort auf Krankheiten eine wesentliche Rolle. In diesem Artikel werden die kulturellen Kriterien der Sierra-Zapoteken untersucht, um Pflanzen als Nahrung und/oder Heilmittel auszuwählen. Diese Kriterien basieren auf binären Formen der Klassifikation. Während die „Heiß“/„Kalt“-Dichotomie dominiert, gibt es andere gegensätzliche Systeme wie bitter/neutral. Ob eine Pflanze als „kalt“, „warm“ oder (in seltenen Fällen) „gemäßigt“ betrachtet wird, hängt hauptsächlich von einer der folgenden Kriterien ab: Standort und/oder Jahreszeit des Wachstums und des Sammelns, Analogie des Aussehens und den Aspekten der zu behandelnden Krankheit oder den mit Wohlbefinden assoziierten Merkmalen (Signaturprinzip) und Geschmacks- und Geruchseigenschaften.

Kriterien zur Pflanzenauswahl basieren nicht auf einem einzelnen klassifikatorischen System, sondern sind eine Integration unterschiedlicher Systeme. Ein Vergleich mit ethnobotanischen Daten der benachbarten Mixe zeigt klar die Unterschiede, die einem anderen kulturellem Hintergrund zugeordnet werden.

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