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Concepts of Medicinal Plants Among the Nahua of the Sierra de Zongolica, Veracruz (Mexico)*[1]

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Summary

As for all Mexican peasant cultures, plants are an essential part of everyday life for the Nahua of the Sierra de Zongolica, Veracruz, Mexico. The economic basis of the Sierra is subsistence agriculture relying on foods like corn, beans, chili, and the commercial production of coffee, a large number of different fruits and vegetables, and to a lesser degree commercial exploitation of wood. Medicinal plants are an important local resource. For the Nahua, culture and nature are intimately connected. Offerings of flowers and alcohol are made to the earth at important times of the year, especially before sowing of the fields.

During 18 months of fieldwork in the Sierra, medicinal plants were collected, and the conceptual basis of plant use was elucidated. In curing, rituals and empirical plant use are closely connected. Ritual cleansing ceremonies are performed and herbal preparations are prescribed as teas, rectal and vaginal douches, compresses and sweat baths. Indigenous criteria for plant use in treatment of illnesses are primarily based on the 'hot/cold' classification of illnesses and medicines. Organoleptic properties (bitter, sweet, aromatic, and sour) are used to recognize or characterize a plant. Bitter plants are used consistently for gastrointestinal illnesses. Decisions determining plant use are based on a complex of traditional symbolic criteria. All concepts have equal standing, but chemosensory properties cannot be subsumed within the 'hot/cold' classification.

Introduction

Medicinal plants are important in many parts of Mexico, including the Nahua of the Sierra de Zongolica. Lack of financial resources is an important reason for Nahua to rely on medicinal plants as a first resource. Western medicines are expensive or frequently unavailable. Plants are of particular importance in the treatment of minor injuries, skin infections, gastrointestinal disorders, and respiratory illnesses. Since many of these traditionally used plants have not been studied scientifically, it is of interest to investigate the pharmacological effects, toxic side reactions and efficacy as well as to isolate the relevant compounds (HEINRICH et al., 1992; WEIMANN and HEINRICH, 1997).

In order to better understand the traditional uses and to evaluate the plants, this research uses an interdisciplinary approach, applying concepts and methods from anthropology and pharmaceutical biology. The use of plants is integrated into a particular culture (ETKIN, 1988; LOGAN and DIXON, 1994), therefore the ethnobotanical background is an important basis. Understanding the criteria for selection of medicinal plants for certain illnesses may also help in the search for new pharmacologically active substances (BALICK, 1990; BERLIN and BERLIN, 1996; FARNSWORTH, 1990).

Each medical system has its own concepts of classification. The one most often discussed for the Meso and South America is the 'hot/cold' system[2] (FOSTER, 1994; LÓPEZ AUSTIN, 1980), but this concept is not the principal one in all regions. Peoples perceive their environment differently. For example, some use the plants to treat a certain illness based on their chemosensory properties such as smell and taste (BRETT, 1994; HEINRICH, this volume). This research draws heavily on ethnolinguistic and cognitive concepts and methods. BERLIN (1992) for example, describes cognitive ethnobotanic aspects of the Highland Maya of Chiapas and LUNA PEÑA (1988) in a village of the Sierra de Zongolica.

This paper gives an overview of the concepts used to select medicinal plants by the Nahua of the Sierra de Zongolica. Examples drawn from the Nahua's daily life, health and illnesses, as well as from plants used as food and medicine are used to illustrate the classificatory systems.

The Sierra de Zongolica in the Mexican state of Veracruz, with a high proportion of Nahua population, is part of the Sierra Madre Oriental. Its area of 1,923 km² lies south of 19° N latitude and is bordered by the Mexican states of Puebla and Oaxaca. The mountains have a very rough topography, and are shaken regularly by earthquakes. With the Pico de Orizaba (5,747 m above sea-level), the Sierra includes the highest elevation in Mexico. The mountain range generally slopes from northwest to southeast. Moisture from the Gulf of Mexico results in regular rainfall, with the exception of March through May when there is a distinct dry season. Therefore the climate is humid with frequent rain and fog. The area is divided into three major zones, depending on altitude: cold highlands (**tierra fría**), temperate intermediate (**tierra templada**), and the hot lowlands (**tierra caliente**). Primary vegetation in the cold highlands is predominantly composed of conifers and oak forests, while in the hot lowlands it is tropical rainforest (AGUIRRE BELTRÁN, 1992).

About 200,000 people live in the Sierra, with approximately 34,000 in the subdistrict (**municipio**) Zongolica, with the principal community (**cabecera**) having the same name (INEGI, 1990). In the formerly isolated region of the Sierra de Zongolica, as in many indigenous areas of Mexico, drastic changes have occured, which were reinforced by the opening of a road in 1956 (BOEGE SCHMIDT et al., 1991; HÜLSEWIEDE, 1992; SOUSTELLE, 1958). In the 16th century the Spaniards passed through the Sierra de Zongolica when Cortés conquered Mexico (then called Nueva España). Village names are composed of a Spanish (its Christian patron) and a Nahuatl part, for example, **San Juan - Texhuacan** (AGUIRRE BELTRÁN, 1992). Today, villages which are connected by paved roads have experienced the greatest changes in culture and language compared to those which can only be reached on foot.

The economic basis of the Sierra is subsistence agriculture, the most important staple foods being corn, beans, and chili. Since the 19th century there has been commercial production of coffee. A large

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[2] In order to differentiate between hot and cold in the context of humoral medical concepts and thermal hot/cold concepts the former ones are put in quotation marks ('...').

number of different fruits and vegetables are also raised, and sometimes forests are exploited by woodcutting. In earlier decades tobacco was an important crop (EARLY, 1982; SUÁREZ Y FARIAS, 1988). Because of limited economic opportunities in the highlands, people often migrate temporarily to the lowlands to earn cash income, working in the large farms and ranches characteristic of the lowlands.
The **Nahuatl** language (called **Mexicano** by the indigenous people), belonging to the Uto-Aztecan language family, is still spoken by a large portion of the population. In the highland zone (tierra frfa) more than 90%, and in the lowland (tierra caliente) approximately 70% of the population are bilingual or monolingual speakers of Nahuatl. Vowels and consonants are generally pronounced as in Spanish. Additionally [tl] is used.

Methods

Ethnomedical and ethnobotanical data were collected in selected regions of the Sierra Nahuatl de Zongolica from September 1993 until February 1995. The differences between the various study sites are climate, geography and varying degrees of influence from the mestizo (persons of mixed European and indigenous American descent) culture. A total of approximately 15 specialists in medicinal plants and/or healers of the different regions were interviewed in detail. These specialists were indicated as being knowledgeable about medicinal plants by several other inhabitants of the community and all were practicing as healers at the time of the study. One of the authors (C.W.) accompanied the key informants to the surroundings of their residential areas to collect the plants which they used as medicines. Information about the plants' uses, parts used, preparation, dose, application, combination with other plants and the plants' properties (according to indigenous criteria) was collected. All data were recorded on ethnobotanical data sheets. Descriptions of illnesses and the forms of treatment were also obtained. Both, symbolic and empirical forms of treatment were recorded. During regular meetings of groups of traditional healers (organized by the Mexican National Indian Institute, INI) and visits to other parts of the Sierra, unstructured interviews and discussions on medicinal plants and the healer's treatment methods were conducted with numerous other inhabitants of the community.
Voucher specimens were collected and identified by comparison with authenticated specimens at the National Herbarium of Mexico (MEXU). A complete set of specimens is available at the National Herbarium of Mexico (MEXU), at the Herbarium of the "Instituto de Ecología" (XAL) in Xalapa, Veracruz, Mexico and at the "Institut für Pharmazeutische Biologie" in Freiburg, Federal Republic of Germany (CWEI 1 - 324). As in all our studies all relevant permits to work in the area, to collect and transport plants and to send voucher specimens and samples overseas were obtained.

Results

Illnesses

For the Nahua of the Sierra de Zongolica an illnesses is a disequilibrium of the body. It can be caused by supernatural forces [**susto** (= sudden fright), **mal aire** (= bad air)]. But thermal influences also may lead to a pathological reaction of the body. If someone has to leave the house after a warm bath in winter, she or he may catch a cold. The following illnesses are described by their thermal properties: fever and infections are hot, a **resfriado** (= cold) is cold. Other illnesses are associated with the seasons. During the cold and humid season, many people have cough and other respiratory illnesses. During the hot summer months before the rainy season starts, there are more cases of gastrointestinal disorders because of lack of clean water. In the hot and rainy season dermatological problems with inflammation are frequent. These are believed to be due to the entering of "microbios" through the skin, for example, if one steps into puddles without shoes.
Diseases, which clinically may have similar symptoms, can be classified into humorally 'hot' (**totonic**) and 'cold' (**cecic**). A cough, for example, may be caused by cold air or it may be a 'hot' cough (bronchitis). Some of the gastrointestinal diseases are classified as 'hot' (**calor de la barriga** = heat of the stomach) or others as 'cold' (stomachache). Diarrhea and dysentery are also classified as 'hot' or 'cold' based on their symptoms ('hot' is associated with the excretion of blood, 'cold' is diagnosed if something white is noted in the excrement).
Minor illnesses are treated at home or by a specialist of herbal medicine. For example, in case of accidents or when the healer does not want to or cannot cure the patient, very sick persons are transported over the mountains to the nearest hospital. Mestizos also look for Nahua healers when they perceive western style doctors as unsuccessful in their treatments. The Nahua usually prefer their own healers because they speak their language and understand their illnesses.

Forms of Curing

When a person is being treated, rituals and empirical plant use are closely connected. Normally the healer begins with a ritual cleansing ceremony (**limpias** or **popohuales**) preferably in front of the house altar, the central place for performing curing rites. The healer asks God for help and permission to cure. The **limpia** is done with an egg, normally one of a chicken, but some prefer duck eggs. This process is also used in the diagnosis of illness. If the cause is regarded to be supernatural (for example, **mal aire**) a ritual follows utilizing medicinal plants which frequently are aromatic [for example, **albahaca** (basil) - *Ocimum basilicum* L., Lamiaceae]. The preferred days for this ritual are Tuesdays and Fridays, but in case of emergency they are conducted on other days.
Another important ritual is the **xochitlali** (= "flowers for the earth"). Offerings of flowers, three candles, alcohol and copal (a resin burned as incense) are made to the earth. In the preparation of medicines, the ritual is used to give the plants greater strength. Traditionally oriented people also conduct this ceremony at important phases of the year, for example, before sowing the **milpa** (fields) or building of a house, (ALVAREZ SANTIAGO, 1991).
Before starting a treatment with herbal teas or other forms of orally used preparations, the patient should make a rectal douche, in order to cleanse the body of all the "bad" which may have caused the illness. This practice also is used before a birth. When a patient is possessed by bad spirits, special forms of healing are employed. The healer prays and orders the spirit to leave that patient. Only healers with a "strong" personality can perform this ritual.

Pregnancy, Birth Control

Pregnancy represents a special situation in the life of a woman and is a very important part of traditional medicine. There are several rules for the pregnant mother to avoid a premature termination of the pregnancy, and for the post partum period. She should not eat cold food. 'Hot' foods are preferred, but all meals have to be very well cooked. Drinking water has to be boiled until 40 days after the birth. Sweat baths, for example, using leaves of coffee (*Coffea arabica* L., Rubiaceae), **ejepactxihuitl** (= "medicinal herb against **mal aire**") *Cestrum lanatum* Martens & Gal., Solanaceae], and chocolate (*Theobroma cacao* L., Sterculiaceae.) help to warm the pregnant woman before, during, and after birth. All medicines for the post partum period are classified as 'hot'.
Contraceptives and abortives are considered 'cold' substances. The child does not like a 'cold' environment, so if it gets too 'cold' inside the mother's body, it will feel uncomfortable and seek to leave the body.

Medicinal Plants

In more isolated regions of the Sierra de Zongolica, it is typical to see plants growing in tins all around the houses. Besides ornamental plants, there are also various plants for basic medical care. For example, **pañalita** (*Lepidium virginicum* L., Brassicaceae) is used for cough in children, or **matlale** [(**matlalin** = plant of "blue color") *Tradescantia pendula* L., Commelinaceae] for urological disorders. Specialists know medicinal plants in their local environment, but additionally there is an exchange of medicinal plants of different regions in the weekly markets. Western medicine presently exerts a major influence. Some traditional healers mix their herbs with pills, for example, to treat amoebiasis, or prescribe antibiotics against infections.

Herbal preparations are prescribed in the form of teas or alcoholic infusions, rectal and vaginal douches, compresses and sweat baths (**temaxcal**). The form of application depends on the type of illness. Skin diseases as well as diseases of the musculo-skeletal system are normally treated with external applications of compresses or washings. Gastrointestinal, urological, and respiratory disorders are treated internally with teas. As in other cultures it is necessary to re-equilibrate the disequilibrium of the body (HAHOLD and KROEGER, 1987). Therefore plants are chosen with opposite properties - a 'cold' illness is cured with a 'hot' plant. Urological diseases are mostly inflammations of the kidneys or bladder. Such complaints are generally regarded as hot. They are cured with teas made from humorally 'cold' plants, for example, **matlale** [(**matlalin** = of "blue color") *Tradescantia pendula* L., Commelinaceae], **coscuatlacuatzin** (*Oenothera rosea* L. Her. ex Ait., Onagraceae), and **lengua de vaca** [(= tongue of a cow) *Rumex obtusifolius* L., Polygonaceae].

Other properties are also important for various cases. The bitter plant **ohpanchichic** (= "double bitter", *Verbena* sp., Verbenaceae), commonly known as **verbena**, is used against colic and is classified as **totonic** ('hot'). Another very bitter plant [classified as **yamamic** ('lukewarm')], **marrubio** (*Marrubium vulgare* L., Lamiaceae) is also employed against colic, vomiting, and diarrhea. Children dislike bitter tastes, therefore sweet or mild plants are preferably used, for example, **hinojo** [(fennel) *Foeniculum vulgare* Mill., Apiaceae] against **empacho** (= upset stomach, frequently with painful gas), and **cempoalxochitl** [(= "twenty flowers") *Tagetes erecta* L., Asteraceae] mixed with other herbs against diarrhea.

In various cases bitter plants, such as the bark of **ventosidad** also called **quina** (*Croton pyramidalis* Donn. Sm., Euphorbiaceae), are used to treat fever, which is a 'hot' illness, or against diabetes [**fresno** - *Fraxinus uhdei* (Wenzig) Ling., Oleaceae]. The latter plant is simultaneously classified as **cecic** ('fresh'). To cure diabetes the sick person has to take bitter medicines because the bitterness 'absorbs the sugar' from the body.

Respiratory disorders or rheumatic diseases associated with coldness are usually treated with sweat baths. It is said that the state of patient improves with warmth. Accordingly the plants employed in these baths are regarded as 'hot', but also have an aromatic smell (**huelic** = "delicious", **huel** = "good"; SIMÉON, 1977). Examples are **xochicuahuitl** (= "tree which blossoms", *Myrica cerifera* L., Myricaceae), its leaves smell like an orange, and laurel (*Nectandra salicifolia* (Kunth) Nees., Lauraceae). These aromatic plants are also used for nervous patients and during convalescence. Respiratory diseases are treated with teas of, for example, **gordolobo** (*Gnaphalium* sp., Asteraceae) and **eucalipto** (*Eucalyptus globulus* Labill., Myrtaceae); for 'hot' cough (bronchitis) with **violeta** (*Anoda cristata* (L.) Schlecht., Malvaceae) is given. Sometimes plants of the same genus have different properties, for example, **hierba buena** (= "good herb") is 'hot', menta is 'cold', both are members of the genus *Mentha* (both *Mentha* spp., Lamiaceae, ARGUETA V. and ZOLLA, 1994). Some epiphytic plants change their properties depending upon which plant they are growing. If **hiedra** (Loranthaceae, indet.) grows on the acid lemontree, it is 'cold', but if it lives on the coffee tree, it is 'hot'. Some chemosensory properties are important means to recognize a plant, but have no influence on their use, for example, **hierba dulce** [(= sweet herb) *Phyla scaberrima* A.L. Juss., Verbenaceae] Moldenke) has a sweet (**tzopelic**) taste, and a lot of fruits are perceived as being sour (**xococ**). Very sour taste has to be neutralized before it is ingested, but it seems that this is due to the general preference for sweet.

Consistency of use can be seen in the fact that bitter plants are generally used for stomach disorders and aromatic plants for baths, but there are plants which do not conform to the classificatory system based on humoral and taste/smell properties. Three examples illustrate this situation.

First, the fruits of **hierba del gusano** [(= herb of the caterpillar) *Phyllanthus niruri* L., Euphorbiaceae] have an appearance like the urtications caused by the hirsute caterpillar which hides on the lower surface of leaves of various plants. The venom of the caterpillar causes strong pain in the body, so directly after contact with this animal, someone must put the crumbled plant onto the wound to prevent the venom from entering the body.

Second, **siempre-me-verás-así** [(= "always-you-will-see-me-like-this") Lamiaceae, indet.] is a plant red like blood and, in combination with the "dark violet **guayave**" [(guava) *Psidium guayava* L., Myrtaceae], is used for dysentery.

Third, **vergonzosa** [(= the bashful) *Mimosa albida* Humb. & Bonpl., Mimosaceae], which folds up its leaves when touched, is employed as tea to speed up labour ("the child is ashamed to go out into the world").

The reactions of the body to a certain plant are carefully observed. Each body may react differently, and therefore if the plant has culturally perceived side reactions, or the illness does not improve, another medication will usually be tried.

Food

In daily life it is important to eat balanced diets to prevent illness. Especially during pregnancy and illnesses someone has to care more about food in order to support the curing. Corn and beans are generally allowed because they are basic food staples. Fruits and vegetables are divided into humorally 'hot' and 'cold'. For example, watermelon, lemon, **quelites** (various potherbs) and potatoes are 'cold', while apples, pears, and the herb **hierba mora** [(= "herb colored like blueberry") *Solanum nigrum* L., Solanaceae] are 'hot'. It is also possible to fall ill, if someone eats a food item at a wrong time, for example, bananas, which are 'cold', if consumed at night because then cause a stomach-ache. By cooking a meal carefully, it is possible to change the humoral properties or to balance them. Accordingly, cooked food is 'hot' and non-cooked food is 'cold'. The same is true, for example, for imported drinks such as lemonade or cola drinks as well as for drinking water.

Discussion

"Traditional" medicine of today in the Sierra de Zongolica is a syncretic mix of Spanish and indigenous traditions, which has developed since the conquest (AGUIRRE BELTRÁN, 1963). For the Nahua of the Sierra de Zongolica the 'hot/cold' system is of greater importance than other classificatory systems. The example presented in this paper is in agreement with FOSTER (1994) and other researchers with regard to the importance of the 'hot/cold' system, but does not address the question of this system's origin. This is one example of how opposing forces of nature are used in indigenous classificatory system. Only a balanced body is healthy. This is in contrast to western societies, where nature is regarded as somthing that ought to be tamed and exploited (COTTON, 1996: 246). The concept of balance is one of the reasons for explaining illnesses using the 'hot/cold' classification, and consequently plants are selected based on humoral concepts. In the present classificatory system organoleptic and humoral properties are considered

Tab. 1: Examples of plants' classification divided into categories

classification				
Nahuatl	**English**	**Indigenous name**	**Latin name**	**use(s)**
totonic	'hot'	gordolobo	*Gnaphalium* sp.	cough
cecic	'cold'	matlale	*Tradescantia pendula*	urological inflammation
totonic/huelic	'hot'/aromatic	xochicuahuitl	*Myrica cerifera*	sweat baths, rheumatism
huelic[1]	aromatic	albahaca	*Ocimum basilicum*	mal aire
totonic/chichic	'hot'/bitter	verbena	*Verbena* sp.	colics
yamamic/chichic	'lukewarm'/bitter	marrubio	*Marrubium vulgare*	colics, vomits, diarrhea
cecic/chichic	'fresh'/bitter	fresno	*Fraxinus uhdei*	fever
tzopelic	sweet	hinojo	*Foeniculum vulgare*	empacho in children
xococ[2]	sour	guayava	*Psidium guajava*	edible sour fruit
---[3]	---	hierba del gusano	*Phyllanthus niruri*	bites of venoumous insects

[1] delicious, which has a good taste, "huel" = good (SIMÉON, 1977)

[2] xocotl = fruit

[3] doctrine of signatures

(MESSER, 1991). While the organoleptic properties are important in many cases, it could not be ascertained whether they have a close relation to the humoral classification. Chemosensory properties are especially employed to recognize or characterize a plant. The most important taste and smell properties are bitter and aromatic. These properties are used in the decision against which illness a plant may be used, for example, bitter plants for some stomach disorders, fevers, and diabetes, and aromatic ones for baths to relax or warm the body. Additionally, the healers explain the use of a certain plant based on the similarity of plant and illness (doctrine of signatures), or on visual impressions. Sometimes they cannot clearly state their reasoning.

These concepts stand parallel to the 'hot/cold' classification. It is **not** possible to subsume, for example, the taste and smell properties under 'hot/cold' classifications. Each set of concepts is autonomous, and may be used simultaneously on one plant. This finding is different from the results of investigators who did not observe other concepts than the 'hot/cold' classification (TEDLOCK, 1987) or who include it under a basic 'hot/cold' classification.

Looking at classification from a linguistic point of view, Nahuatl is not very rich in words descriptive of plant properties, using the known systems of classification. BERLIN and KAY (1991: 16) proposed a correlation between color vocabulary and general cultural complexity. For small populations with limited technology living in isolated areas the differentiation of fine shades in nature are more important than gross differences. For example, among the Nahua there are not any differences in the expression for fresh and cold (**cecic**) and for the colors blue and green (**xoxoctic**), but there exist the shade dark blue/green (**matlalin**).

Perhaps the Nahua concepts will change in the future because there is much influence from mestizo culture. Programs of the national health organizations for healers and midwives promote the penetration of biomedical ideas into traditional medicine. Traditions such as the use of indigenous language and the practice of native medicine are disappearing. The use of a mixture of pharmaceuticals and herbs is one instance. Some pills are also included within the 'hot/cold' system, for example, a commercial digestive treatment is considered to be 'cold'.

More detailed anthropological studies in other regions of the Sierra de Zongolica are needed to prove and to expand the observations made to this point. These studies preferably should be conducted in the cold zones (tierra fría), because in those areas traditional forms of treatment still exist to a greater extent.

Taste/smell properties and cultural concepts of plants in general are one criterion for the selection of plants for pharmacological and phytochemical investigations (HEINRICH, 1994). These data also help us to better understand concepts of medicinal plants within a culture (ORTIZ DE MONTELLANO, 1976) and interculturally. The interdisciplinary approach of our work requires both natural science and anthropological methods. Those analyses and pharmacological studies (BORK et al., 1996) can help to explain the local division into the various classificatory concepts and properties. The combination of natural science and anthropological methods is a potentially valuable and interesting way to study classificatory systems, as well as to complement purely anthropological studies.

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Zusammenfassung

Arzneipflanzenvorstellung der Nahua der Sierra de Zongolica, Veracruz (Mexiko)

Wie für alle ländlichen, mexikanischen Kulturen sind bei den Nahua der *Sierra de Zongolica*, Veracruz (Mexiko) Pflanzen ein essentieller Teil des Alltagslebens. Die ökonomische Existenzgrundlage in der Sierra ist der Anbau von Nahrungsmitteln wie Mais, Bohnen, Chili und die kommerzielle Kaffeeproduktion, einer großen Zahl verschiedener Früchte und Gemüse und zu einem geringeren Teil die kommerzielle Nutzung von Holz. Arzneipflanzen sind eine wichtige lokale Ressource. Für die Nahua sind Kultur und Natur innig verknüpft. Blumen und Alkohol werden der Erde zu wichtigen Ereignissen im Jahr und vor der Aussaat auf den Feldern als Opfergaben dargebracht.

Während 18 Monaten Feldarbeit in der Sierra wurden Arzneipflanzen gesammelt und die begriffliche Grundlage der Pflanzenverwendung aufgeklärt. Während Heilungen sind Rituale und der empirische Pflanzengebrauch eng verbunden. Rituelle Reinigungszeremonien werden ausgeführt und Kräuterzubereitungen als Tees, rektale und vaginale Spülungen, Kompressen und Dampfbäder verordnet. Indigene Kriterien des Pflanzengebrauchs in der Behandlung von Krankheiten sind hauptsächlich in der „Heiß"/„Kalt"-Klassifikation von Krankheiten und Heilmitteln begründet. Organoleptische Eigenschaften (bitter, süß, aromatisch und sauer) werden verwendet, um eine Pflanze zu erkennen oder zu charakterisieren. Bittere Pflanzen werden durchweg für gastrointestinale Krankheiten verwendet. Entscheidungen zum Gebrauch von Pflanzen basieren auf einem Komplex traditioneller, symbolischer Kriterien. Alle Konzepte haben den gleichen Stellenwert; chemosensorische Eigenschaften können daher nicht der „Heiß"/„Kalt"-Klassifikation untergeordnet werden.

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