

PHCOG REV. : Review Article

Antitussive plants used in Mexican traditional medicine.

José Waizel-Bucay^{1*}, Salomón Waizel-Haiat²

^{1*} *Escuela Nacional de Medicina y Homeopatía. Instituto Politécnico Nacional. Guillermo Massieu H. # 239. Ticomán, Mexico, D. F. josewaizel@hotmail.com*

² *Hospital de Especialidades, Centro Médico Nacional Siglo XXI. Instituto Mexicano del Seguro Social. México, D. F. swaizel@hotmail.com*

*Author for correspondence: jwaizel@ipn.mx

Abstract.

The plants have been used as antitussives agents due to their anti-inflammatory, antibiotic, antiviral, demulcents, expectorant and mucolytic properties, related with their ability to elaborate active principles such as aldehydes, alcohols, alkaloids, essential oils, glycosides, flavonoids, gums, ketones, lactones, mucilages, oleoresins, pectin, phenols, tannins and terpenoids. To know which plants are used in Mexican traditional medicine as antitussives, several texts and journals were consulted and analyzed. Results: This paper provides a comprehensive list of about 81 plants, belonging to 42 different families. They grow wild or cultivated in different Mexican regions; we present their scientific name and synonyms, the botanic family, their corresponding common name, part of the plant employed, form of preparation of the remedy, and some of their major active constituents or active principles. Asteraceae (Compositae), Lamiaceae (Labiatae), Boraginaceae, Rosaceae and Brassicaceae (Cruciferae), was the principal families reported, perhaps their secondary metabolites as i.e. sesquiterpenes and essential oils. The flowers, leaves, and aerial parts are most frequently used. The mainly common form of preparation is as decoction or infusion (tea) and the administration type is usually oral.

Keywords: Antitussive plants, cough medicine, medicinal plants, Mexican traditional medicine.

Introduction

Since ancient times, humans have found plants to be a useful resource for satisfying many of their needs, not only the most basic one for food but also, among others, for obtaining relief from illness and disease. There have never been a people or culture that has not left oral or written testimony regarding its use of plants for this latter purpose, or that has not searched the surrounding flora for possible remedies for disease. Since Paleolithic times update, the search has continued without interruption, first, based only on intuition and trial-and-error, and later, by observing the similarities between the shapes of some of the fruits, seeds and flowers and the nature of the disease or the shape of the affected organ. At present, the exploration of flora continues in an empirical manner, keeping popular wisdom and conviction, knowing that a big proportion, over 98%, of flora still remains unexplored. (1)

Research carried out during the last few decades has certified the use of several plants employed in traditional medicine. The knowledge of these sources of medicinal substances is transmitted from one to another generation.

Cough is a normal physiological mechanism. It is a sudden, noisy and somewhat violent expulsion of air from the lungs, a reflex action caused by an irritation of the air passages, which helps protect the respiratory apparatus from spores, cysts, bacteria, viruses, dust particles, accumulated phlegm, and strange matter. According to its type, a cough can be persistent, constant or occasional (e.g., one that appears after meals [postprandial cough]), or repetitive, occurring in spasmodic fits. It can be dry or accompanied by expectoration or phlegm (moist or white cough); it might even carry blood.

Depending on its intensity, it can be mild, tormenting, “doggy”, noisy, or accompanied by aphonia, and occasionally it might even produce a bluish tint of the face. Chronic or persistent cough is a symptom of a subjacent pathology that has to be investigated.

Every person inhales about eight liters of air per minute, containing a large number of impurities and potentially harmful germs. To protect itself, the respiratory apparatus has a complex defense system, in which a permanent or, more frequently, a transitory immunity is sometimes established against certain of the aggressors.

A large number of remedies derived from medicinal plants are used for the treatment of cough. Plants are rich in a wide variety of secondary metabolites as: aldehydes, alcohols, alkaloids, essential oils, glycosides, flavonoids, gums, ketones, lactones, mucilage, oleoresins, pectins, phenols, tannins and terpenoids. Their activity can be expectorant or anti-inflammatory, as well as antimicrobial and/or antiviral. Gums, mucilages and pectins are expectorants. Alkaloids (codeine, hydrocodeine ethyl morphine and hydromorphone, theophylline [dimethylxanthine], papaverine, ephedrine, atropine, etc.), —they may act centrally on the brain, and specifically the vagus nerve or locally (on the respiratory tract to suppress the cough reflex—. As well as essential oils (eucalyptus, menthol, thymol, etc.) and oleoresins (turpentine, guaicol, creosol, phenols, alcohols, acetones, aldehydes, etc.) have anti-inflammatory and/or antiviral and bactericidal activity. Phenols, sesquiterpenes, and tannins are strongly bactericidal. (2-7)

The aim of this paper is to identify and describe the plants which are used as antitussives in Mexican traditional medicine, including related information (scientific synonyms, botanic family, plant parts used and major active constituents or active principles) collected from previously published databases, pharmacognosy, and other books and journals.

Material and Methods.

In order to reach the proposed objective, the methodology consisted of a bibliographic analysis by keyword (Antitussive, cough, and medicinal plant), scientific name and botanic family. In addition, several texts and journals were consulted and analyzed, including Pharmacognosy, Phytochemistry, books on medicinal plants, as well as web databases. (8-69)

Results and Discussion

Table 1 provides a list of 81 species that grows wild or are cultivated and which are used as antitussives in different regions of Mexico, along with their scientific name and synonyms, botanic family, corresponding common name, plant parts employed, form of preparation of the remedy, and major active constituents or active principles.

Without a doubt, Mexican vegetation is one of the world's most complex and diverse, comprising about 25,000 species of flowering plants alone. Flores Mata, et al. (37) claim that, with few exceptions, almost all the principal types of vegetation in the world can be found in Mexico, a number they estimate to be 25. (38)

Moreover, some authors maintain that Mexican traditional medicine includes 4,000 species, many of which are used by the 62 different ethnic groups (12 million persons) surviving in this country (39) as well as by many other inhabitants of Mexico. However, in the case of a large number of these plants, not enough pharmacological and phytochemical research has been conducted to validate the popular uses to which they are given. Much still needs to be learned and many questions must be answered. The present study opens up new avenues for exploring these rich natural resources and for carrying out further analyses, with a view to developing the potential of herbal medicine.

Conclusions

Eighty-one species used as antitussives in Mexico were found, belonging to 42 botanic families, of which Asteraceae (Compositae) and Lamiaceae (Labiatae) was the most important, because their secondary metabolites as sesquiterpenes and essential oils. The flowers (15), leaves (12), and aerial parts (8) are most frequently used. fruit and complete plant (7); roots = 6; and branches = 4. The most common form of preparation is as a decoction or infusion (tea), and the type of administration is usually oral.

Acknowledgements

The first's author would like to thank to Comisión de Operación y Fomento de Actividades Académicas (COFAA) & to the Programa de Estímulos al Personal Docente (Instituto Politécnico Nacional, México), the grants conferred. We also express our gratitude to Maria-Luisa Torres-Cabrera (BSc), Professor Patricia Andrade & Dr. Juan Salas-Benito for their collaboration in preparing the English version of the manuscript.

References

- 1) J. Kumate. La medicina herbolaria contemporánea. In: Varios autores. *La Investigación científica de la Herbolaria Medicinal mexicana*. Edición conmemorativa 50 años. Secretaría de Salud. México. (1993).
- 2) H.W. Lewis & P.F. Memory Elvin-Lewis. *Medical Botany, Plants affecting man's health*. John Wiley & Sons Inc. USA. (1977).
- 3) H. Lucas. *El gran libro de la salud. Enciclopedia médica de Selecciones del Reader's Digest*. Reader's Digest. México. (1971).
- 4) Selecciones del Reader's Digest, *Plantas Medicinales. Virtudes insospechadas de plantas conocidas*. Selecciones del Reader's Digest. México. (1995).
- 5) M.M. Cowan. Plant products as antimicrobial agents. *Clin Microbiol Rev.* **12**: 564-582. (1999).
- 6) G.J. Sandoval. Terapéutica farmacológica en otorrinolaringología. Trillas; México. (1997).
- 7) L.P. Shubina, S.A. Siurin & V.M. Savchenko. Inhalations of essential oils in the combined treatment of patients with chronic bronchitis. *Vrach Delo.* **5**:66-7 (1990).
- 8) V.K. Agnihotri, SK. Lattoo, RK. Thappa, P. Kaul, GN Qazi, AK Dhar, A Saraf, BK. Kapahi, RK. Saxena & SG. Agarwal. Chemical variability in the essential oil components of *Achillea millefolium* agg. from different Himalayan habitats (India). *Planta Med.* **71**(3):280-3 (2005).
- 9) C.A. Aguilar, JR. Camacho, S. Chino, P. Jáquez & EM. López. Herbario Medicinal del Instituto Mexicano del Seguro Social. Información etnobotánica. Instituto Mexicano del Seguro Social. (1994).
- 10) A. Aguilar, JR. Camacho, S. Chino, P. Jáquez & EM. López. Plantas Medicinales del Herbario IMSS. Cuadros básicos por aparatos y sistemas del cuerpo humano. Instituto Mexicano del Seguro Social; México. (1996)
- 11) J. Bruneton. Farmacognosia Fitoquímica Plantas Medicinales. Acribia Zaragoza. España. (2001).
- 12) I.G. Cool. Sesquiterpenes from *Cupressus macrocarpa* foliage. *Phytochemistry.* **66**(2):249-60 (2005).
- 13) A.Dar, S. Faizi, S. Naqvi, T. Roome, S. Zikr-ur-Rehman, S. Ali M, Firdous & ST. Moin. Analgesic and antioxidant activity of mangiferin and its derivatives: the structure activity relationship. *Biol Pharm Bull.* **28**(4):596-600 (2005).
- 14) GO. De Melo, MF. Muzitano, A. Legora-Machado, TA. Almeida, DB. De Oliveira, CR. Kaiser, VL. Koatz & SS.Costa. C-glycosylflavones from the aerial parts of *Eleusine indica* inhibit LPS-induced mouse lung inflammation. *Planta Med.* **71**(4):362-3 (2005)..
- 15) J.L. Díaz. Índice y sinonimia de las plantas medicinales de México. Monografías Científicas. Instituto Mexicano para el Estudio de las Plantas Medicinales; México. (1976).
- 16) P. Font Quer. Plantas Medicinales. El Dioscórides renovado. Labor. México. 1962.
- 17) S. Glasl, P. Mucaji, I. Werner, A. Presser, E. Haslinger & J. Jurenitsch. Sesquiterpenes and flavonoid aglycones from a Hungarian taxon of the *Achillea millefolium* group. *Z Naturforsch [C]*. **57**(11-12):976-82 (2002).
- 18) González EM, López EL, González EMS, & Tena FAJ. Plantas Medicinales del estado de Durango y Zonas Aledañas. Instituto Politécnico Nacional; México. (2004).
- 19) A.J. Duke. Dr. Duke's Phytochemical and Ethnobotanical Databases. Available at <http://www.ars-grin.gov/cgi-bin/d.uke/farmacy2.pl>.
- 20) R. Ficarra, P. Ficarra, S. Tommasini, ML. Calabro, S. Ragusa, R. Barbera & A. Rapisarda. Leaf extracts of some *Cordia* species: analgesic and anti-inflammatory activities as well as their chromatographic analysis. *Fármaco.* **50**(4):245-56 (1995).
- 21) A.M.A. Martínez, O.V. Evangelista, C.M. Mendoza, G.G. Morales. Catálogo de plantas útiles de la sierra norte de Puebla México. Cuadernos 27. Instituto de Biología. Universidad Nacional Autónoma de México, México. 2001.
- 22) M. Martínez. Las Plantas Medicinales de México. México. Botas. 1959.
- 23) D. Muntean, C.E. Vari, S. Imre & M.T. Dogaru. Qualitative determination of flavonoids and phenol-carboxylic acids of indigene *Stachys* species using HPLC method. *Rev Med Chir Soc Med Nat Lasi.* **108**:712-7 (2004).
- 24) I.E. Navarro-Beltrán. Diccionario terminológico de ciencias médicas. Salvat, México. (1992).
- 25) S. Philipov, R. Istatkova, N. Ivanovska, P. Denkova. Phytochemical study and antiinflammatory properties of *Lobelia laxiflora* L. *Z Naturforsch [C]*. **53**:311-7 (1998).

Table 1: Plants used in Mexico as antitussives.

Scientific name ¹ (Botanic Family)	Common names ²	Plant part (s) used ³	Form of use ⁴	Main chemical compounds (Phytochemical information) ⁵
<i>Acer negundo</i> L.: <i>Rulac negundo</i> Hitchc. : <i>Acer negundo</i> var. <i>vulgare</i> Pax (Aceraceae).	Negundo, acccinte (S). Ash-leaf maple, acer leafed maple, ash leaved maple, box elder, three- leaf maple (E).	N/d.	N/d.	Elaborates saponins, tannic essence, triterpenic esters (acerocin, acerotin).
<i>Achillea millefolium</i> L.(Asteraceae).	Ciento en rama, cola de zorra, miel en rama, milenrama, plumajillo (S). Bloodwort, carpenter's weed, common yarrow, milfoil, nosebleed, old man's pepper, soldier's woundwort, thousand weed, yarrow, etc. (E).	A/p.	Or.	Essential oils (type 1,8,cineol, borneol, β -caryophyllene), fatty acids, alkanes monoterpenes, guaiano-sesquiterpenes (rupicoline A y B, 1-deoxy-1 α -peroxide-rupicoline A y B), flavonoids (apigenine and centaureidine). β -sitosterol, 3 β - sitosterol. 3 β -hidroxi-11- α -13-dihydro-costunolide, α - thujone, α -terpineol, α -terpinene, α -terpineol, desacetyl- matricarine, leucodine, achiline, 8- α -angelo xileucodine, 8- α -angeloxy-achiline, quercetin, quercitrin, etc. Elaborates cyanogenic glycoside toxic to man and animals (HCN generated by hydrolysis) Reported as toxic to sheep and bovine cattle.
<i>Allium cepa</i> L. (Liliaceae).	Cebolla, thumps, xonácatl (S). Onion, shallot (E).	Bu.	Or.	Allicin, alliin, benzyl-isothiocyanate, β -sitosterol, pectin, caffeic, citric, ferulic, malic, p-coumaric, protocatechuic & vanillic acids, cycloartenol, cycloeucaleanol, diallyl-disulfide, kaempferol, quercetin-3-0- β -glucoside, rutin, stigmasterol.
<i>Aloe vera</i> (L.) Burm. f. (Aloaceae)	Sábila (S). Aloe (E).	A/p.	Or.	Pulp shaken and drink in fast. Contains mucilages, suggars. C vitamin.
<i>Arceuthobium</i> cf. <i>cryptopodium</i> Engelm. (Loranthaceae, Viscaceae, Santalaceae).	Flor de ocote, injerto, muérdago enano (S). Dwarf mistletoes (E).	A/p.	In. Or.	<i>Arceuthobium</i> genus contens: Flavonoids, phenolic compounds, viscin mucilage,
<i>Arceuthobium vaginatum</i> Humb. & Bonpl. ex Willd.) J. Presl. (Loranthaceae, Viscaceae, Santalaceae).	Injerto, muérdago enano (S). Pine dwarf mistletoes, southwestern dwarf-mistletoe (E).	A/p.	In. Or.	<i>Arceuthobium</i> genus contens: Flavonoids, phenolic compounds, viscin mucilage,
<i>Archibaccharis hieracifolia</i> var. <i>hieracoides</i> (Blake) Jackson (Asteraceae).	Gordolobo (S).	N/d.	N/d.	The Asteraceae members elaborates sesquiterpene lactones.
<i>Bombax ellipticum</i> Kunth. : <i>B.</i> <i>mexicanum</i> Hemsl. : <i>Carolina fastuosa</i> DC.(Bombacaceae).	Amapola, bailador, bailarina, cabellos de ángel, Carolina, ceiba, chichochuchi, chilochuchi, clavelina, iztamatl, lele, k'uyché, pochote, titilámatl, xanacol (S). Shaving brush tree (E).	Fl.	De., Or.	<i>Bombax ceiba</i> (<i>Ceiba pentandra</i>) elaborates β - sitosterol, β -D- glucoside, HCN, organic acids, lupeol, flavonol-glycosides (shamimin), mangiferin, tannic acids, gossypol, kaempferol, myristic acid, & quercetin. Other species (<i>B. malabaricum</i>) elaborate anthocyanins, sesquiterpenic lactones and naftoquinones.

<i>Borago officinalis</i> L. (Boraginaceae).	Borruga, borraja (S). Beebread (E).	A/p.	In. Or.	Drink with milk, drink preferently at night. Elaborates: alkaloid, allantoin, amabiline, anthocyanin, boldine, campherol, carotene, cyanidin, delphinidin, dhurrin, essential oil, flavonoids, hydrogen cyanide, hydroxyproline, intermedine, isocorydydine, lycopsamine, norisocorydine, organic acids, quercetin, resins, rosmaric acid, saponins, supinine, tannins, thesinine.
<i>Bougainvillea</i> aff. <i>buttiana</i> Holtt & Standley (Nyctaginaceae).	Bugambilia, colorada (S). Paper flower (E).	Fl. (Bc.)	De., In., Or.	<i>B. glabra</i> contains β -xantine, polifenols, quercitine, koblenhydrate and ciclytate, citoquines, fatty acids and fosfatidilserin. <i>B. spectabilis</i> contains the flavonoids (spinasterol and quercitine).
<i>Bougainvillea glabra</i> Choisy (Nyctaginaceae).	Bugambilia rosa (S). Paper flower (E).	Fl. (Bc.)	De., In., Or.	Contains β -xantine, polifenols, quercitine, koblenhydrate and ciclytate, citoquines, fatty acids and fosfatidilserin. <i>B. spectabilis</i> contains the flavonoids (spinasterol and quercitine).
<i>Bougainvillea</i> spp. (Nyctaginaceae).	Azalia de guía, bugambilia, camelina, b. colorada (S). Paper flower (E).	Fl. (Bc.)	De., In., Or.	<i>B. glabra</i> contains β -xantine, polifenols, quercitine, koblenhydrate and ciclytate, citoquines, fatty acids and fosfatidilserin. <i>B. spectabilis</i> contains the flavonoids (spinasterol and quercitine).
<i>Bursera collina</i> Brandegee (Burseraceae).	Copal (S). Bursera, lignaloe, linaloe (?) (E).	Ba., L.	De., Or.	<i>Bursera delpechiana</i> elaborates: essential oils: α -terpineol, cis-2,6,6-trimethyl-2-vinyl-5-acetoxytetrahydropyran, geraniol, geranyl-acetate, limonene, linalol, linalol-monoxide, linalol-oxide-furanoid, linalyl-acetate, methyl-acetate, methyl-heptenol, methyl-heptone, myrcene, nerol, neryl-acetate, resin, trans-2,6,6-trimethyl-2-vinyl-5-acetoxythrahydropyran.
<i>Bursera palmeri</i> S. Wats (Burseraceae).	Copal, palo cuchara, mostochi, sisote (S). Bursera, lignaloe, linaloe (?) (E).	Ba., L.	De., Or.	<i>Bursera</i> spp. elaborates very monoterpenoids (α -terpineol, terpinen-4-ol, α -thujene, linalool and limonene), sesquiterpenes and long-chain hydrocarbons.
<i>Caesalpinia pulcherrima</i> (L.) Swartz. : <i>Poinciana bijuga</i> Lour. : <i>P. elata</i> Lour. : <i>P. pulcherrima</i> L. (Fabaceae).	Cacasúchit, chacalo-xóchitl, chacsinkin, flor de camarón, f. de guacamaya, tabachin (S). Barbados flower-fence, Barbados-pride, bird of paradise, dwarf Poinciana, flower-fence, paradise-flower, pride-of-Barbados, red bird of paradise bush (E).	Fl.	De., Or.	Elaborate leucodelphinidin, lupeol, lupeol-acetate, myricetin, ellagitannin, ellagic, gallic & tannic acids. flavonoids (miricitroside, 5,7-dimethyldimetoxiflavonone, 5,7-dimetoxi-3',4'-metilendioxyflavonone, isobonducelin, 2'-hydroxi-2.3.4'.6'-tetrametoxychalcone, bonducelin), quercetin, rutin, diterpenoids (isovouacapenol, pulcherrimine), etc. It might cause serious gastroenteritis by larch doses ingestion. Toxic seeds and leaves (HCN).
<i>Chrysanthemum parthenium</i> (L.) Bernh. : <i>Tanacetum parthenium</i> Schultz Bipontinus (Asteraceae).	Bolitas, hierba de Santa María, margarita, (S). Bachelor's buttons, fever-few (E).	N/d.	N/d.	Contains: alantolactone, apigenine, artecanin, artemorin, borneol, borneol, cadiene, camphor, carvacrol, caryophyllene, chrysanthenyl, chryseriol, cineol, copaene, cosmosiin, curcumene, eugenol, cymene, cymene, epicanin, essential oil, farnesene, farnesene, flavone, germacrene, guaianolides, hidroxicostunolide, hidroxyparthenolide,

<i>Cirsium nivale</i> (Kunth) Sch. Bip. : <i>Cnicus nivalis</i> Kunth. (Asteraceae).	Cardo santo (S). Thistle (E).	Fl.	Or.	humulene, hydroxyarbusculin, limonenen, linalool, melatonin, myrcene, phellandrene, pinene, pinocarvone, proazulene, pyrethrin, quercetagenin, reynosin, sabinene, sabinol, santamarin, santin, secotanaparthalides, sesquiterpene lactones, sitosterol, tanacetin, tanaoarthin, tanetin, terpinen, terpinene, terpinene, terpineol, terpinolene, thujene, thujopsen, thymol. <i>Cnicus benedictus</i> elaborates: absynthin, alkaloid, α -amyrin, astragalin, campesterol, cinnamaldehyde, cosmosiin, arctigenin, arctiin, ascorbic and ferulic acids. β -carotene, β -sitosterol, cinnamaldehyde, cnicin, luteolin, kaempferol-3-O-glucoside, stigmasterol, tannins, etc. Can cause vomiting. <i>Cirsium tenoreanum</i> synthesizes flavonoids (apigenin, quercetine-3-O-galctoside and caempferol-3-O-rhamnoside).
<i>Cirsium subcoriacen</i> (Less.) Sch. Bip. (Asteraceae).	Cardo santo (S). Thistle (E).	N/d.	N/d.	Possibly elaborate the same compounds as <i>Cirsium nivale</i> .
<i>Cordia boissieri</i> A. DC. : <i>Lithocardium boissieri</i> Kuntze: (Boraginaceae).	Anacahuítl, anacahuíte, macahuíte, rasca viejo, siricote, trompillo (S). Anacahuita, tapas olive tree, Texas olive (E).	Fl., Fr., W.	De., Or.	Fruit is used preserved with sugar, and pills are prepared out of the the wood extract. Contains gallic and tannic acids (tannins), gum and resin. The <i>Cordia</i> genus has sesquiterpenes, phenylpropanoids, benzoquinones triterpenoids, flavonoid-glycosides (robinin, rutin, datiscoside and hesperidine, dihydrorobinetin), caffeic, chlorogenic and rosmarinic acids. and saponins.
<i>Cordia globosa</i> (Jacq.) Kunth. : <i>C. globosa</i> Andr. ex DC. (Boraginaceae).	Ateje, copillo, cuajatinta (S). Curaciao bush (E).	N/d.	N/d.	Elaborates meroterpenoid benzoquinone, and microphyllaquinone, a known naphthoquinone.
<i>Crataegus mexicana</i> Moc. & Sesé : <i>C. pubescens</i> (H.B.K.) Steud (Rosaceae).	Belohui, caiasa, carasu, chisté, manzanillo, manzanita tejocotera, tejocote, texxotl (S). Mexican hawthorn (E).	Fr., St. + L.	De., Or.	<i>Crataegus</i> spp. Contains triterpenic pentacyclic and phenolic acids. aromatics amins, essential oil, flavonoids (hiperoside, quercetil, spereoside, rutoside), apigenol, proto anthocyanidols (procyanidol, epicatecol), β -carotene, β -sitosterol, catechin-tannins, apigenin, aesculin, etc. Rosaceae have poisonous glycosides (amygdalin).
<i>Crescentia cujete</i> L. (Bignoniaceae).	Árbol de las calabazas, cirián, cuatecomate, jícara, güira, rat'axyá (S). Calabash tree (E).	Fr.	N/d.	Fruit whit crecentic, citric, tartaric and tannic acids. Furanonaphthoquinones, resins, bitter & aromatic extractive substance, a coloringf matter, alkyl glycosides iridoid glycosides (crescentosides A-C), aucubin, and p-hydroxybenzoyloxy glucose.
<i>Cryptocarpa procerá</i> H.B.K. (Anacardiaceae).	Ciruela, chupandilla, coco.	L.	In. Or.	Few genus in Anacardiaceae family elaborates phenols some of them poisonous.
<i>Cupressus</i> sp. (Cupressaceae).	Chuche, pino, cedro blanco (S). Cypress (E).	Fr., L., Ba.	Or.	Elaborates β -thujaplicine, monoterpenes, diterpenes, sesquiterpenes, lignanes, catechines and flavonolic oligomers, essential oils (pinene).

<i>Dahlia coccinea</i> Cav. : <i>D. pinnata</i> var. <i>coccinea</i> (Cav.) Voss in Vilm. : <i>Georgina coccinea</i> (Cav.) Willd. (Asteraceae).	Chalihuesca, dahalia, dalia, flor de invierno, jícama del cólera, jicamite, xicamacuete (S). Red dahlia (E).	R., St.	Or.	<i>Dahlia</i> spp. Concentrates antibiotics on the tubercles' skin. Additionally elaborates uridin-di-phosphate, and flavonoid glycosides.
<i>Dianthus caryophyllus</i> L. (Caryophyllaceae).	Clavel (S). border carnation, carnation, clove pink, divine-flower (E).	Fl.	In.	Anthocyanins, caempherol (triglycoside), cyanidin-3-glucoside, essential oil, eugenol, flavonoids, methyl-salicylate, phenols, raffinose, saponins, stachyose, toxic proteins (dianthins).
<i>Draba</i> sp. (Brassicaceae).	Flor de panal, nube (S).	N/d.	N/d.	The Brassicaceae contains sulpho & methylglucosinolates.
<i>Echeveria gibbiflora</i> Moc. & Sessé ex DC. : <i>Cotyledon gibbiflora</i> (Moc. & Sessé ex DC.) Baker (Crassulaceae).	Oreja de burro, metate de piedra, tememeta, lishmaquetu-ni (S). Liveforever (E).	L.	De., Or.	From <i>Bryophillum calycinum</i> (Crassulaceae) have been isolated bufadienolides, flavonoidic –glycosides, alkanes, alcohols, triterpenes, steroids, and phenolic compounds.
<i>Eleusine indica</i> (L.) Gaertn. : <i>E. scabra</i> E. Fourn : <i>Cynosurus indicus</i> L. (Poaceae).	Gama de caballo, grama de caballo, pata de caballo, yakma'as, Yokma'as, zacate de guacina, zacatón (S). Common hydrangea, crabgrass, crowfoot grass, fowlfoot grass, Indian goose grass, goose grass, wire grass, yard grass (E).	N/d.	N/d.	<i>E. indica</i> has C-glycosilflavones. and <i>E. coracana</i> , phenolic acids (caffeic, gallic and protocatechuic acids). <i>Eleusine</i> genus elaborates cyanogenic glycosides poisonous to man and animals (releases HCN by hydrolysis).
<i>Ephedra aspera</i> Engelm. ex S. Wats. : <i>E. nevadensis</i> S. Wats. var. <i>aspera</i> (Engelm ex S. Wats.) L. Benson : <i>E. reedii</i> Cory : <i>E. peninsulares</i> I.M. Johnst. (Ephedraceae).	Cañatillo, cañutillo, itamo real, sanguinaria, tepopote (S). Rough jointfir, ephedra Brigham tea, Mormon tea (?) (E).	St., R.	Or.	<i>Ephedra nevadensis</i> elaborate vicenin-2, the alkaloid (-)-ephedrine, tannic acid, resin, etc. From <i>E. equisetina</i> and <i>E. sinica</i> also the alkaloid (-)-ephedrine, as well as flavonoids and protoanthocyanidols. Should be used only for a short time.
<i>Eryngium deppeanum</i> Cham. & Schlecht. (Apiaceae).	Cardo santo, hierba del sapo, piñita (S).	N/d.	N/d.	<i>E. foetidum</i> elaborates. 2,4,5-trimethylbenzaldehyde, 2-dodecen-1-al, capric-acid, 3,4-dimethylbenzoic-acid, 4-hydroxy-3,5-dimethylacetophenone, 5-dodecanone, α -pinene, decanal, EO, fenquicil-alcohol, flavonoids, furfural, lauric-acid, p-cymene, saponin, sesquiterpene-ketone.
<i>Eucalyptus</i> spp. (Myrtaceae).	Eucalipto, gigantón(S). Eucalyptus, blue gum tree, gum, stringy bark tree (E).	L.	In., Or.	Dangerous in high doses. Contains essential oils with 1, 8 cineol (eucalyptol), α -phellandrene, citronellal, several terpenes, phenols (tannins), flavonoids (rutoside, hiperoside and methylated flavones), etc.
<i>Eupatorium petiolare</i> Moc. & Sessé ex DC. : <i>Ageratina petiolaris</i> (Moc. & Sessé ex DC.) R.M. King & H. Rob. (Asteraceae).	Hierba del ángel, hierba del burro, yoyochichil, yoyoxhí (S).	Br.	Or.	<i>Eupatorium cannabinum</i> elaborates eupatoriopicrine, bitter essence, euparine, sesquiterpenic lactones (germacranolides), flavonoids, benzofuranes, essential oil and pyrrolizidine alkaloids (echinatine, licopsamine, intermedine, rinderine, supinine) & saponins.
<i>Fouquieria splendens</i> Engelm. : <i>F. splendens</i> subsp. <i>brevifolia</i> Henr. (Fouquieriaceae).	Albarda, barba, barda, ocotillo, ocotillo de corral, xong, xeshish, (S). Vine-cactus (E).	Fl., L., St.	De., Or.	The Fouquieriaceae elaborates iridoids (secoiridoids), monoterpenes, triterpenes, flavonols, elargic acid, miricetin O.

<i>Gaultheria</i> spp. (Ericaceae).	Axocopaconi, ajocopaque, ajopatla, arrayán, axocopaque, axoxoxo (S). Wintergreen (E).	Br.	In., Or.	<i>Gaultheria procumbens</i> elaborates essential oils and polyphenols (tannins), α & β -amyrin, arbutin, β -sitosterol, campesterol, ericolin, gaultherin, organic acids (caffeic, ferulic, gallic, gentisic, gentisinic, p-coumaric, p-hydroxy-benzoic, salicylic, syringic, tannic, ursolic & vanillic), lupeol. The genus contains a toxic diterpene (acetylandromedol).
<i>Gentiana bicuspidata</i> (G.Don) Briq. (Gentianaceae).	Flor de hielo(S).	Br.+ Fl.,	In., Or.	<i>Gentiana acaulis</i> and <i>G. lutea</i> elaborates: amarogentine, bitter essence, bitterglicosides, carvacrol, essential oils (α -terpineol, carvacrol, linalool, limonene), gentiamarine, gentiacauline, gentianine, gentianose, gentiacauloside, gentialutine, gentisine, P-oxy-cinnamo-idelfinidin-monoglycoside, mangiferin, mucilages. Caffeic, nicotinic, phenolic, protocatechuic, phytosterol, & sinapic acids. pectin, secoiridoids, sweroside, xantones (gentisine, isogentisine, gentioside).
<i>Gentiana spathacea</i> Kunth. : <i>G. coerulea</i> Sessé & Moc : <i>Coilantha mocinni</i> D. Don ex G. Don : <i>C. sessaei</i> D. Don ex G. Don : <i>Dasystephana spathacea</i> (Kunth) Arthur. (Gentianaceae).	Juanilipilli, flor de hielo, hielera, yolera. (S). Gentian (E).	St., Fl., L.	N/d.	<i>Gentiana acaulis</i> and <i>G. lutea</i> elaborates: amarogentine, bitter essence, bitterglicosides, carvacrol, essential oils (α -terpineol, carvacrol, linalool, limonene), gentiamarine, gentiacauline, gentianine, gentianose, gentiacauloside, gentialutine, gentisine, P-oxy-cinnamo-idelfinidin-monoglycoside, mangiferin, mucilages. Caffeic, nicotinic, phenolic, protocatechuic, phytosterol, & sinapic acids. pectin, secoiridoids, sweroside, xantones (gentisine, isogentisine, gentioside).
<i>Geranium mexicanum</i> H. B. K. : <i>G. seemannii</i> var. <i>minoriflorum</i> Briq. (Geraniaceae).	Mano de león, pata de león, tlalauhcapatli, nesesehuilone. (S). Geranium (E).	C.	In., Or.	<i>G. maculatum</i> elaborates tannins (gallic acid), gums, resins. <i>G. thunbergii</i> synthesises protocatechuic acid, (+)-catechine, brevifoline, corilagine, elaeocarpusine, elagic acid, elagitannins, geraniine, caempheritrine, pyrogalol, caempherol, pentagaloil-glycose, quercetin.
<i>Gnaphalium</i> spp. (Asteraceae).	Gordolobo, dictamo real, papaconi, tzomponic (S). Everlasting, cudweed (?) (E).	C.	In., Or.	Sesquiterpenic lactones, saponins, tannins, terpenoids. Additionally, the Asteraceae family elaborates essential oils and caffeic acid (terpenoids). Warning: do not confuse this species with the similar <i>Senecio longilobus</i> that contains pyrrolicidine alkaloids extremely poisonous (hepatotoxic). Its used combined with garlic cloves, and bougainvillea flowers (bracts).
<i>Gomphrena decumbens</i> Jacq. (Amaranthaceae).	Amor seco, cabeza, granadita, siempreviva silvestre (S).	N/d.	N/d.	<i>Gomphrena</i> genus contens betacyanins & flavones. <i>G. macrocephala</i> elaborate triterpene glycosides. <i>G. agrestis</i> elaborates aurone glucosides. <i>G. martiana</i> & <i>G. boliviana</i> elaborates favones whit antimicrobial proprieties.
<i>Hedeoma</i> spp. (Lamiaceae).	Hierba buena, orégano grueso, piperita de México, poleo, Santo Domingo, bho'mkox oriigan (S). American pennyroyal (E).	C. L.	In., Or.	Dangerous in high doses. <i>Hedeoma drummondii</i> elaborates 1,8, cineol, α -pinene, β -felandrene, β -pinene, borneol, camphene, camphor, citronellal, geranial, isomentone, isopulegone, limonene, menthol, mentone, mircene, neral,

					pulegone, sabinene, terpinen-4-ol, trans-ocimene.
<i>Heliocereus schanrkii</i> Britton & Rose : <i>H. elegantissimus</i> : <i>H. luzmariae</i> : <i>Cereus elegantissimus</i> : <i>Disocactus schanrkii</i> (Seitz) Barthlott (Cactaceae).	Cola de tlacuache, flor de junco (S).	N/d.	N/d.		This genus has comestible fruits. The cactaceae elaborates: alkaloids, flavonoid aglycones, mucilages.
<i>Heliotropium arborescens</i> L. : <i>H. corymbosum</i> Ruiz & Pav. : <i>H. peruvianum</i> L. (Boraginaceae).	Heliotropo (S). Cherry-pie, common heliotrope, heliotrope (E).	L.	In., Or.		The <i>Heliotropium</i> genus elaborates: essential oil, putrescine, espermidine, espermines, indicine, indicine- N-oxyde, lasiocaspine, and alkaloyds of the pyrrolidizine type (lindelofidine, pyrrolizidinadiol, trachelanthamidine y retronecine). Its considered a toxic plant if ingested in a large amount.
<i>Heliotropium indicum</i> L. : <i>H. cordifolium</i> Moench. : <i>H. foetidum</i> Salisb. : <i>Eliopia riapria</i> Raf. : <i>E. serrata</i> Raf. : <i>Heliophytum indicum</i> (L.) DC. (Boraginaceae).	Alacrancillo, bigotitos, cola de mico, cola de alacrán, hierba de la mula, lengua de sapo, rabo de mico (S). Indian heliotrope, turnsole (E).	R.	In., Or.		Its used combined with “chicken weed” (“hierba del pollo”) (<i>Commelina</i> sp.). The <i>Heliotropium</i> genus elaborates: essential oil, campesterol, stigmaterol, β -sitosterol, putrescine, espermidine, espermines, indicine, indicine- N-oxyde, lasiocaspine, and alkaloids of the pyrrolidizine type (lindelofidine, pyrrolizidinadiol, tannic essence, trachelanthamidine and retronecine). Its considered a poisonous plant when ingested in a larch amount. In <i>H. indicum</i> was founded cyanogenic glycosides poisonous to men and animals (its generated HCN by hydrolysis).
<i>Hibiscus rosa-sinensis</i> L. (Malvaceae).	Bis, chininia, nepapa xóchitl, obelisco, rosa china, súchil, tulipán (S). China-rose, Chinese hibiscus, Hawaiian hibiscus, hibiscus, rose-of-China, rose de Chine, shoe-flower (E).	Fl.	De., Or.;		Malvaceae are rich in mucilage (polysaccharides), flavonoids, phenolic acids, antocyanines and escopoletol. <i>Hibiscus</i> presents citric, cyanhidric, malic, tannic and tartaric acids. β -carotene, hentriacontane, pectin, quercetin, rutin and saponin.
<i>Hibiscus spiralis</i> Cav. (Malvaceae).	Alperés, bomol. tulipán ? (S).	N/d.	N/d.		Malvaceae are rich in mucilage (polysaccharides), flavonoids, phenolic acids, antocyanines and escopoletol. <i>Hibiscus</i> genus presents arabinogalactan. β -caroten, β -sitosterol, campesterol. Caprylic, citric, cyanhidric, formic, glycolic, malic, malvalic, myristic, pelargonic, propionic, protocatechuic, sterculic, tannic and tartaric acids. β -carotene, delphinin, delphinidin, ergosterol, flavonoids, gossypetin, hentriacontane, mucilage, pectin, pentosan, phytosterol, quercetin, resin, rutin, saponin & xylose.
<i>Hymenaea courbaril</i> L. (Fabaceae).	Aky pexy, cuapinole, cuapinol (S).	S.?	N/d.		Elaborates xyloglucans whit immunomodulatory activity, also diterpenes and ent-halimane diterpenoids.
<i>Impatiens balsamina</i> L. (Balsaminaceae).	Balsamina, chachupina, chico, gachupina blanca madama, (S). Garden balsam, rose balsam, touch-me-not (E).	N/d.	N/d.		Anthocyanidins (pelargonidin), balsamininones A & B, flavonols (kaempferol). diglucosides, acylated diglucosides, naphtaquinone.

<i>Ipomoea murucoides</i> Roem. & Schult. (Convolvulaceae).	Árbol del muerto, casahuate, casahuate prieto, pájaro bobo, palo bobo, palo del muerto (S).	N/d.	N/d.	Contains resin glycosides (murocoidins I-V). The <i>Ipomoea</i> = <i>Convolvulus</i> genus, elaborates: elymoclavine (a CNS-stimulant), ergometrine, and toxic hallucinogen alkaloids (isoergine). <i>I. aquatica</i> contains principles as: ascorbic acid, β carotene, pectin and tocopherol, while <i>I. purga</i> elaborates escopoletin. In several species it was founded cyanogenic glycosides poisonous to men and animals (HCN is generated by hydrolysis).
<i>Ipomoea setosa</i> Ker-Gawl.: <i>I. melanotricha</i> Brandeg. : <i>I. pavonii</i> Choisy : <i>Batatas setosa</i> (Ker Gawl.) Lindl. : <i>Calonyction pavonii</i> (Choisy) Hallier f. : <i>C. setosum</i> (Ker Gawl.) Hallier f. : <i>Convolvulus setosus</i> (Ker Gawl.) Spreng. (Convolvulaceae).	Campanilla, campanuda (S). Brazilian morning glory (E).	Fl., R.	N/d.	The <i>Ipomoea</i> = <i>Convolvulus</i> , genus elaborates: elymoclavine (a CNS-stimulant), ergometrine, and toxic hallucinogen alkaloids (isoergine). <i>I. aquatica</i> contains principles as: ascorbic acid, β carotene, pectin and tocopherol, while <i>I. purga</i> elaborates escopoletin. In several species it was founded cyanogenic glycosides poisonous to men and animals (HCN is generated by hydrolysis).
<i>Lepidium virginicum</i> L. : <i>L. gerloffianum</i> Vatke ex Thell. (Brassicaceae).	Ajonjolillo, antijuelilla, cuisique, chilillo, chintá, hierba del pajarito, lentejilla, mastuerzo, panalillo, pimpinillo, riñoncillo (S). Least peppercorn, peppercorn, poor-man's-pepper, Virginia peppercorn, Virginia-cress, wild pepper-grass (E).	C.	In., Or.	<i>Lepidium sativum</i> elaborates: alkaloids, α -tocopherol, arachidic, ascorbic, linoleic, oleic, and sinapic acids. benzil-isothiocyanate, benzil-thiocyanate, β -carotene, β -sitosterol, essential oils (diallyl-sulphur(polysaccharids), mucilages, mufa, niacin. The family elaborates glycosinolates, steroids and triterpenes.
<i>Leucophyllum frutescens</i> (Berland.) I. M. Johnston: <i>L. texanum</i> Benth: <i>Terania frutescens</i> Berland (Scrophulariaceae).	Cenizo (S). Texas ranger, Texas sage, silverleaf (E).	N/d.	De., Or.	Elaborates furofuran lignans with antitumorigenic and phytotoxic constituents: diayangambin, epiyangambin, diasesartemin and epiashantin.
<i>Lithospermum distichum</i> Ort. (Boraginaceae).	Acacóyotl, hierba de la comezón, Santa Marta (S). Gromwell or stoneseed (E).	L.	De., Or.	<i>Lithospermum erythrorhizon</i> elaborates benzoquinone (phenolic compound) R-sikonin and the genus has toxic glycosides and pyrrolizidine alkaloids
<i>Lobelia laxiflora</i> Kunth. var. <i>angustifolia</i> A. DC. : <i>L. cavanillesiana</i> Roem. & Schult. : <i>L. concolor</i> M. Martens & Galeotti : <i>L. fissa</i> Willd. Ex Roem. & Schult. : <i>L. haenkeana</i> A. DC. : <i>Rapuntium cavanillesianum</i> C. Presl : <i>Siphocampylus mollis</i> Regel : <i>Tupa laxiflora</i> (Kunth) Planch. & Oerst. (Lobeliaceae).	Acaxóchitl, aretitos, campanita, cúralo todo, chilpanxóchitl, chilpantlazolli, jarritos, lobelia, panxóchitl, pipilo-xóchitl, toxcuitlapil-xóchitl, xochipipile (S). Sierra Madre lobelia, indian tobacco(?) (E).	R.	N/d.	The genus elaborates lobelin, strong emetic that tends to paralyze the respiratory movements, elaborates also three piperidinic alkaloids. Its a poisonous plant.
<i>Marrubium vulgare</i> L. (Lamiaceae).	Marrubio, marrubio, mastran, mastranto, mastro, mastranzo cimarrón, mbanga, uitzá, vitsiqua (S). Common horehound,	A/p.	In., Or.	Elaborates: α -terpinolene, apigenin, β -elemene, β -sitosterol, β -pinene, cosmosiin, cynaroside, isoquercetin, marrubin (bitter principle with diterpenic unions), essence, fats, p-cymene, p-cymol, sabinene, tannins,

	European horehound, white horehound, hoarhound (E).				terpenes, flavonoids, piperidin derivate alkaloid (bentonicin), glycosid and acid saponin, vicenin-2, etc.
<i>Matthiola incana</i> (L.) R. Br. : <i>Cheiranthus incanus</i> L. (Brassicaceae).	Alelí, alelí blanco, alhelí blanco, alhelí encarnaris (S). Stock (E).	A/p.	N/d.		Considerated as poisonous plant. Cruciferae family, contain fatty oils, glycosides that decomposes to produce a sulphurated essence (mustard like) cheiroside and cheirotoxin, very active and dangerous cardiotonics.
<i>Mentha pulegium</i> L.: <i>M. daghestanica</i> Boriss. : <i>Pulegium dagestanicum</i> (Borris.) Holub.: <i>P. vulgare</i> Mill. (Lamiaceae).	Poleo, poleo europeo (S). European pennyroyal, pennyroyal, west asiatic, north african pennyroyal (E).	L., Fl.	De., Or.		Dangerous in large dosis. <i>Mentha x piperita</i> elaborates: essential oils, 1-8-cineol, α -humuleno, aromadendrene, caffeic, chlorogenic, & p-coumaric acids. caiophilene-oxye, anetol, β -bourbonene, β -carotene, β -caryophyllene, β -humulene, β -ionone, coumarin, eugenol, limonene, luteolin, menthol, pectin, perilil-alcohol, piperitone, piperitenone, rutin, tannins, vainillin, etc.
<i>Origanum majorana</i> L.: Majorana hortensis Moench. (Lamiaceae).	Mejorana, orégano (S). Garden marjoram, marjoram, pot marjoram, sweet marjoram (E).	C.	In., Or.		Essential oil with terpin-1-en-4-ol, d- α -terpineol, α -terpinene, campesterol, caryophyllene, chavicol, cosmosiin, γ -terpinene, geraniol, hydroquinone, linalool-acetate, luteolin-glucoside, sabinene hydrates, linalol, saponins, sesquiterpenes, tannic acid, terpinene, thymol, etc.
<i>Origanum vulgare</i> L. (Lamiaceae).	Orégano (S). Common Turkish oregano, European oregano, European, Asiatic or African marjoram, wilden or wilder marjoran (E).	Br., C.	In., Or.		Essential phenolic oils (thymol, carvacrol, etc.), one sesquiterpene, free alcohol, cosmosiin, cuminal, elemol, eriodictyol, eugenol, geranil acetate, germacrene, heneicosane, sabinene, staquiose, tannins, etc.
<i>Persea americana</i> P. Mill. (Lauraceae).	Aguacate, On. (S). Avocado (E).	N/d.	N/d.		Contains: anethol, anthocyanidins, bitter essence, campesterol, carotene, citrostadienol, cryptoxanthin, cycloartenol, dopamine, essential oil, estragol, folacin, galactitol, glycerin, heptacosan, isolutein, linolenic and linoleic acids, lutein, methyl chavicol, nonacosan, organic acids, pentacosan, phenylalanine, phylloquinone, phytate, phytosterol, proline, quercetin, serotonin, sitosterol, sitosterol, subaphyllin, tannins, tocopherol, violaxanthin.
<i>Protium copal</i> (Schl. & Cham.) Engl. (Burseraceae).	Copal, copal negro (S).	Fr.	Or.		<i>Protium</i> species elaborates aromatic oleoresines nonvolatiles and essential oils (dominated by α -pinene, sabinene and limonene), quercetines, etc.
<i>Prunus persica</i> (L.) Batsch. (Rosaceae).	Durazno, flor de durazno, melocotón, melocotonero (S). Peach (E).	S.	Or.		Contains: acetic, citric & malic acids. Methylene-cycloartanol, amygdalin, phenolic antioxidants (phenolics acids & flavonoids). The seed (nut) have an alkaloid (persicaside) and contains is the most dangerous. Amygdalin in contact with water releases cyanhydric acid (cyanide gas [HCN], lethal).

<i>Prunus serotina</i> ssp. <i>capulli</i> (Cav.) Mc. Vaugh : <i>P. capuli</i> Cav. (Rosaceae).	Capolín, capulín, cerezo mexicano, xegua (S). Capulí, cherry wild, virginian prune, black cherry (E).	Fl.	In., Or.	Mucilages (pectins), genistein, phenolic antioxidants (phenolics acids & flavonoids), cyanogenic glycosides (amygdalin and prunasin), folacin, kaempferol, tannic acid, etc. Danger all parts of the plant are poisonous, even lethal. The seed (nut) is the most dangerous. Amygdalin in contact with water releases cyanhydric acid (cyanide gas [HCN], lethal).
<i>Raphanus sativus</i> L. : <i>R. acanthiformis</i> J.M. Morel ex Sasaki : <i>R. chinensis</i> Mill. <i>R. macropodus</i> H. Lév. : <i>R. niger</i> Mill. : <i>R. raphanistrum</i> subsp. <i>sativus</i> (L.) Schmalh. (Brassicaceae).	Rábano, coo-guiña-nagali, gulgila-ztilla (S). Radish, wild radish, cultivated radish, jointed charlock (E).	R. Ju., C.	Or.	Elaborates: caffeic, ferulic, p-coumaric, & sinapic acids. phenylalanine, fluorine, folacin, glucobrassicin, putrescine, triacontane, the antibiotic raphanin. The tubercle contains a mustard oil glycoside (sulphur glycoside) that by enzymatic reaction produces the radish essence and the raphine. It has oils in the seed.
<i>Rosmarinus officinalis</i> L. (Lamiaceae).	Guixi-cicanaca, romero, romero extranjero (S). Mediterranean rosemary, rosemary (E).	Br., L.,	In., Or.	Essential oils (camphor, cineol, α -pinene, free borneol and sterified borneol, campheno), rosmarinic acid, linalol, humulene, (E)- β -ocimene, 1,8,cineole, verbenol, α -pinene, cineol, diosmine, borneol, rosmarine camphor, rosmanol. α -amyrin, α -humulene, apigenin. Ascorbic, betulinic, caffeic, chlorogenic, oleanolic, and ursolic acids. β -carotene, β -elemene, β -sitosterol, betuline, cariophyllene, carnosol, escualene, geraniol, hispiduline, (+)-limonene, luteolin, nepetin, pectin, tannins.
<i>Salvia lavanduloides</i> Kunth. (Lamiaceae).	Bacal nicho, chabacal, nish vomol, poleo (S). Sage, Spanish sage (E).	C.	In., Or.	Essential oils (terpenoids), flavonoids and one sterol. Ascorbic, caffeic, chlorogenic, fumaric, gallic, malic, oleanolic, p-coumaric, salicylic, ursolic, and vanilic acids. α -amirine, α -humulene, apigenin, β -carotene, β -sitosterol, β -sitosterol-D-glycoside, betuline, cariophyllene, carnosol, geraniol, hispiduline, limonene, luteolin, nepetin, pectin, tannins, uvaol.
<i>Sambucus mexicana</i> C. Presl. ex DC. : <i>S. bipinnatus</i> Schltld. & Cham. : <i>S. simpsonii</i> Rehder : <i>Aralia sololensis</i> Donn. Sm. (Caprifoliaceae).	Azumiatl, barrendo, chihil-té, cundemba, cumdumba, cumptempa, horchata, sauco, saúco, tengatsi, xumetl (S). Blue elderberry, elderberry, Mexican elder (E).	Fl.	De., Or.	It's taken when going to bed. <i>Sambucus nigra</i> contains flavonoids (rutoside, isoquercitroside), caffeic derivatives free and sterified, triterpenes (essential oil with 3,7,.dimetyl-1,3,7-octatrien-3-ol, linalol, cis-hexenol and rose oxides).
<i>Sechium edule</i> (Jacq.) Swartz : <i>S. americanum</i> Lam. : <i>Sicyos edulis</i> Jacq. : <i>Chayota edulis</i> Jacq. (Cucurbitaceae).	Ac xac, ac xay, apopu, tzihu, ecshna, cal-mishi, cojoyo de erizo, chaiot, chayote, chayote espinoso, ecshna, guan-xan, kix-pach-kuum, quelite espinoso, maclhtucu'n, mishi, nap, etc. (S). Chaco, chayote, chayote squash, choco, choko, Madeira marrow, vegetable pear (E).	L., Fr., St., R.	Or.	Citrulline, GABA, phospholipids, oxalic acid, proteins, triterpenoids alkaloids (cucurbitacin). Other <i>Sechium</i> species have saponins (tacacosides).

<i>Senecio sinuatus</i> Kunth (Asteraceae).	Gordolobo, hediondilla (S).	N/d.	N/d.	The <i>Senecio</i> genus elaborates: betulin, essential oil, germacrenes, flavonoids, poisonous (pyrrolizidin) alkaloid, senecionine, sesquiterpenlactones, tannins.
<i>Solanum madrense</i> Fernarld (Solanaceae).	Berenjena, ux jak (S). Eggplant ? (E).	Fl.	De., Or.	<i>Solanum</i> spp. elaborates many steroidal toxic alkaloids (e.g. atropine, solanidine, solanine) & sapogenines,. <i>S. melongena</i> produces: arachic, ascorbic, caffeic, chlorogenic, ferulic, pipercolic & tannic acids. Cyanidin, delphinidin, folacin, GABA, HCN, lycopene, phytosterols, scopoletin, etc.
<i>Solanum rostratum</i> Dunal (Solanaceae).	Abrojo, ayohuistle, rabo de iguana (S).	N/d.	N/d.	The genus contains many steroidal alkaloids (e.g. atropine, chaconide, solanidine, solanine), sapogenines,. methyprotodioscine (saponine & furostanol glycosides).
<i>Solanum torvum</i> Swartz. (Solanaceae).	Berebjena,conoca, lok, puluxnu, sosa (S). Wild eggplant (E).	N/d.	N/d.	The genus contains alkaloids (solasodine) & sapogenines, ascorbic, caffeic & chlorogenic acids, isoflavonoids (torvanol A), steroidal glycosides (torvosides A & H), cholorogenine, neosospigenine, neochlorogenine, solaspigenine
<i>Stachys coccinea</i> Jacq. : <i>S. coccinea</i> Ortega (Lamiaceae).	Borraja del monte, mirto (S). Hedge-nettle (E).	L.	In., Or.	<i>Stachys</i> spp. elaborates iridoides, flavonoids (quercetol, rutoside, miricetin) and phenol-carboxylic acids (caffeic chlorophenic and ferulic acids), essential non terpenic oils (hexadecanoic acid, carvacrol and eugenol), sesquiterpenes (α -copaene, espatulenol, β -cariophyllene).
<i>Tagetes lunulata</i> Ort. : <i>T. signata</i> Baril. (Asteraceae).	Cinco llagas, flor de las 5 llagas, flor de muerto, cempazuchil (S).	A/p.	Or.	<i>Tagetes</i> genus elaborates: caffeic, elagic, and p-coumáric acids. α -carotene, β -carotene, β -sitosterol, caempherol, caempherol-7-O-rhamsoside, D-limonene, D-limonene, geraniol, lutein quercetine y terpineol.
<i>Ternstroemia pringlei</i> (Rose) Standley (Theaceae, Ternstroemiaceae).	Flor de tila, tilia estrella (S).	N/d.	N/d.	<i>Ternstroemia gymnanthera</i> contains betulinic & oleanolic acids.
<i>Thymus vulgaris</i> L. (Lamiaceae).	Tomillo (S). Common thyme, culinary thyme, garden & Mediterranean thyme (E).	Br.	In., Or.	Alkaloid, alcohol, apigenin, essential oils (cineol, citral, terpineol, α -thujene, β -caryophyllene, β -sitosterol, thymol, carvacrol, eugenol), apigenine heterosides, campesterol, camphor, carvacrol, luteolin, cymol, diosmetin, organic acids, metoxylated flavones, terpenoids (caffeic acid), triterpenes, phenolic acids or polyphenols (tannins), biphenilic compounds, etc.
<i>Tilia</i> spp. (Tiliaceae).	Tila, tilia, tilo, sirimo, yaca (S). Basswood, lime tree, american basswood, american lime (E).	Fr.	In., Or.	The genus contains essential oils, (phenilacetaldehyde, monoterpenes) mono and sesquiterpenes (linalol, geraniol, farnesol, camphor, carvone, cineol), phenolic compounds: phenolic acids, flavonoids (quercitrocides, tilirosides, hiperosides), mucilage, protoanthocyanidols, tannins.
<i>Verbena ciliata</i> Benth. : <i>Glandularia bipinnatifida</i> (Nutt.) Nutt. (Verbenaceae).	Alfombrilla, alfombrilla del campo, buí, hierba del ojo, verbena (S). Dakota mock vervain (E).	N/d.	In., Or.	<i>Verbena officinalis</i> has alkaloid, α -sitosterol, aucubin, essential oils, citronellal, cornin, apigenin, 4'-hydroxywogonin, hastatoside, lupeol, mucilage, stachyose, verbenalin, caffeic, tannic and ursolic acids. β -carotene, lupeol and tannins.

<i>Verbesina crocata</i> (Cav.) Less. : <i>Bidens crocata</i> Cav. (Asteraceae).	Capitaneja, nahuitiput, segundo chimalácatl, zacanhuitéputz (S).	A/p.	In. Or.	The genus <i>Verbesina</i> are toxic to livestock, and have sesquiterpene lactones (eudesmane type). Saponins, tannins, terpenoids. Additionally, the Asteraceae family elaborates essential oils and caffeic acid (terpenoids).
<i>Vinca minor</i> L. (Apocynaceae).	Cielo raso, flor de cielo (S). Dwarf periwinkle (E).	N/d.	N/d.	Contens: alkaloids, bitter essence, carotene, flavonoids. Gentisinic protocatechuic & vanillic acids, intybin, loganic, picrinine, reserpine, robinin, robinoside, saponins, tannins, triacontane, vincadifformine, vincamine, vincaminorine, vincarubine, vincasine, vincatine, vincine, vincristine, β -sitosterol.
<i>Zingiber officinale</i> Roscoe : <i>Amomum zingiber</i> L. (Zingiberaceae).	Agengible, ancoas, gengibre, jengibre (S). Ginger (E).	N/d.	N/d.	Aframodial, essential oils. aromadendrene, aromadendrene. Ascorbic, aspartic, caffeic, chlorogenic, ferulic, gadoleic, myristic, p-coumaric-p-hydroxy-benzoic & pipercolic acids. Benzaldehyde, β -bisabolene, β -bisabolol, β - carotene, β -caryophyllene, β -elemene, β -eudesmol, β -farnesene, β -himachalene, β -ionone, β -myrcene, β -phellandrene, β -pinene, β -santalol, β -selinene, β -sesquiphellandrene, β -sitosterol, β -thujone, bisabolene, bisabolene, borneol, bornyl-acetate, calamenene, campesterol, camphene, camphene camphen, camphene-hydrate, campherol, camphor, capsaicin, caryophyllene, chavicol, chrysanthemin, cineol, cis-nerolidol, cis-rose-oxide, cis-sesquisabinene-hydrate, delphinidin, delta-cadinene, diethylsulfide, elemol, epizonarene, essential oil, ethyl-isopropyl-sulfide, ethyl-myristate, eugenol, farnesal, farnesene, farnesol, ferulasyre, furfural, fytosterin, galanolactone, geranial, gingerdione, gingerol, glutelin, glyoxal, guaiol, hexahydrocurcumin, humulene, juniper-camphor, lecithin, leucine, limonene, linalol, linalool, melatonin, mentha--dien-7-ol, menthol-acetate, methyl-allyl-sulfide, methyl-caprylate, methylgingerol, methyl-glyoxal, methyl-heptenone, methyl-isobutyl-ketone, myricetin, myrtenal, neoisopulegole, neral, nerol, nerolidol, nerolidol, nerol-oxide, n-heptane, paradol, patchouli-alcohol, p-cymen-8-ol, p-cymene, pentadecanoic-acid, pentan-2-ol, pentosan pentosan, perillaldehyde, perillen, perillene, phytosterin, phytosterolprolamine, proline, propionaldehyde, quercetin, raffinose, rosefuran, sabinene, salicylate, saponins, sesquiphellandrene, sesquiphellandrol, sesquithujene, shikimic-acid, shogaol, stearic acid, stigmasterol, threonine, tricyclene, vanillic-acid, vanillin vanillin, xanthorrhizol, zerumbodienone, zingerberone, zingerone, zingibain, zingiberene, zingiberenol, zingiberine, zingiberol, zingiberone, zonarene.

Notes. ¹The scientific names were verified as far as possible, but not all are current. Some synonyms are included. *sp.* = undetermined species. *spp.* = with various species. ²The common names are in Spanish (S), or in the indigenous languages actually spoken in Mexico, as maya, nahuatl, totonaca, tepehua, zapoteca, etc.; some are given in English (E) only as a reference, for comprehensibility. ³Abbreviations: A/p = aerial part. Br = branch. Ba = bark. Bc = bract. C = complete plant. Fl = flower. Fr = fruit. Ju = juice. L = leaf. N/d = not determined. R = root. St = stem. W = wood, timber. ⁴ Use form: In. = Infusion (tea). De. = decoction (boiling in water 10 -20 minutes). Or. = oral. ⁵Secondary metabolites and possible active principles are included, as well as the compounds present in the genus or in other species, when no reference regarding the phytochemistry of such species was found. The phytochemical information refers about the reports for the plant no the active compounds. Sources are mentioned in the references section. Caution: Essential oils should be used for inhalation only or externally with caution. They should never be ingested or given orally when concentrated, due to their potential toxicity. Reactions to them depend on each person's sensitivity. Essential oils may cause contact dermatitis (skin and mucous irritation).

References contd.

- 26) JE. Ramírez-Wong. Estudio fitoquímico preliminar de varias especies del género *Sechium* endémicas de Costa Rica. Licenciatura en Química. Tesis. Universidad de Costa Rica Escuela de Química San José (Costa Rica). San José. Universidad de Costa Rica. CR. (1996). Available at <http://www.ots.ac.cr/rdmcfns/datasets/viewrec.phtml?ds=global&fn=/usr/local/www/htdocs/rdmcfns/datasets/binabitrop/data/23513.html&cdn=3718&realds=usr>.
- 27) Y.K.Rao, S.H. Fang & Y.M. Tzeng. Anti-inflammatory activities of flavonoids isolated from *Caesalpinia pulcherrima*. *J Ethnopharmacol.* 100. (3): 249-253 (2005).
- 28) D.J. Robins. Pyrrolizidine alkaloids. *Natural Prod Rep.* 8:213-221. (1991).
- 29) SD. Seigler. Plants of Oklahoma and Texas capable of producing cyanogenic compounds. *Proceedings of the Oklahoma Academy of Science.* 56: 95-101 (1976).
- 30) C.J.P. Sousa, S.C.J. Rocha, M.A. Pessoa, D.A.L. Alves. Estudo preliminar da atividade antiinflamatória de *Bryophillum calycinum* Salisb. *Revista Brasileira de Farmacognosia (Brazilian Jour of Pharmacognosy).* 15:60-64 (2005).
- 31) F. Stirpe, D.G. Williams, L.J. Onyon, R.F. Legg W.A. Stevens. Dianthins ribosome-damaging proteins with anti-viral properties from *Dianthus caryophyllus* L. (carnation). *Biochem J.* 195(2):399-405 (1981).
- 32) G. Stojanovic, N. Radulovic, T. Hashimoto, R. Palic. In vitro antimicrobial activity of extracts of four *Achillea* species: The composition of *Achillea clavennae* L. (Asteraceae) extract. *J Ethnopharmacol.* 101(1-3): 185-190 (2005).
- 33) Volak J, & Vtodula J. El gran libro de las plantas medicinales. Edit. Susaeta. Checoslovaquia. (1983).
- 34) J. Waizel-Bucay. Index Herbarium Índice de las Plantas contenidas en el Herbario de la Escuela Nacional de Medicina y Homeopatía. Instituto Politécnico Nacional. México. (2001).
- 35) GR. Whitley. The medicinal and nutritional properties of Dahlia spp. *J Ethnopharmacol.* 14 (1):75-82 (1985).
- 36) J. Ramírez, V.G. & V.G. Alcocer. Sinonimia vulgar y científica de las Plantas Mexicanas. Oficina Tipográfica de la Secretaría de Fomento. México. (1902).
- 37) Flores-Mata, L. Jiménez-López, X. Madrigal-Sánchez, F. Moncayo-Ruiz, et al. *Mapa y descripción de los tipos de vegetación de la República Mexicana.* Secretaría de Recursos Hidráulicos. Dirección de Agrología. México. (1971).
- 38) R. Dirzo. Presentación. In F. González Medrano. *Las comunidades vegetales de México.* Primera Edición. Instituto Nacional de Ecología. México. (2003).
- 39) X. Gálvez-Ruiz. Los pueblos Indígenas de México. In: Pueblos Indígenas del México Contemporáneo. Available at http://cdi.gob.mx/index.php?id_seccion=1066 (2006).
- 40) G.F. Hawksworth, & D. Wiens. Dwarf mistletoes: Biology, Pathology & Systematics. Agriculture Handbook 709. US Dept. of Agriculture. Forest Service. Available at <http://books.google.com.mx/books>. (1966).
- 41) M. Martínez. Las Plantas Medicinales de México. Botas, S.A. México. (1959).
- 42) D.C. Miles. & W.C. Hagen Jr. The differentiation of pigmentation in flower parts, IV. Flavonoid elaborating enzymes from petals of *Imatiens balsamina*. *Plant Physiol.* 43: 1347.1354 (1968).
- 43) L. Cherigo & R. Pereda-Miranda. Resin glycosides from the flowers of *Ipomoea murucoides*. *Journal of Natural products.* 69(4): 595-599 (2006).
- 44) J. Jung-Rae Rho, Ch. Soo Jun, Y. Ae Ha, M. Ja Yoo, M. Xun Cui, H. Seung Baek, J. A Lim, Y. Haeng Lee & K. Yun Chai. Isolation and Characterization of a New Alkaloid from the Seed of *Prunus persica* L. and Its Anti-inflammatory Activity. *Bull. Korean Chem. Soc.* 28 (8) 1289-1293 (2007).
- 45) Hurtado Rico In: C. Rodríguez Jiménez & CA. Aguilar. Estudio Cualitativo y Cuantitativo de la Flora Medicinal del Municipio de Copándaro de Galeana, Michoacán, México. *Polibotánica.* (22):21-50 (2006).
- 46) MM. Canales, DT. Hernández, NJ. Caballero, RA. Romo de Vivar, DA. Durán & SR. Lira. Análisis cuantitativo del conocimiento tradicional de las plantas medicinales en San Rafael, Coxcatlán, Valle de Tehuacán-Cuicatlán. México. *Acta Botánica Mexicana.* 75: 21-43 (2006).
- 47) I.J. Chávez-Servía, J. Tuxill & I.D. Jarvis. Manejo de la diversidad de los cultivos en los agroecosistemas tradicionales. Instituto Internacional de Recursos Fitogenéticos (IPGRI). Cali, Colombia. Available at <http://www.ipgri.cgiar.org/publications/pdf/1068.pdf>. Accessed July 27, 2008.
- 48) E. Gedalovich-Shedletzky, P.D. Delmer & J. Kuijt. Chemical Composition of Viscin Mucilage from Three Mistletoe Species—A comparison. *Annals of Botany.* 64: 249-252 (1989).
- 49) N.A.M, Villavicencio, & E.E.B. Pérez. Plantas útiles del estado de Hidalgo. Hidalgo, Hidalgo, Universidad Autónoma del Estado de Hidalgo. México.
- 50) E. Gotfredsen. Liber Herbarum II. The incomplete reference guide to Herbal Medicine. Available at <http://www.liberherbarum.com/Pn0022.HTM>. Accessed august 15, 2008.
- 51) M. Kuroda, T. Aoshima, M. Haraguchi, M.C. Young, H. Sakagami & Y. Mimaki. Oleanane and taraxerane glycosides from the roots of *Gomphrena macrocephala*. *J Nat Prod.* 69 (11):1606-10 (2006).
- 52) Y.Z. Cai, J. Xing, M. Sun M & H. Corke. Rapid identification of betacyanins from *Amaranthus tricolor*, *Gomphrena globosa*, and *Hylocereus polyrhizus* by matrix-assisted laser desorption/ionization quadrupole ion trap time-of-flight mass spectrometry (MALDI-QIT-TOF MS). *J Agric Food Chem.* 54(18):6520-6 (2006).
- 53) E.O. Ferreira, M. J. Salvador, E.M. Pral, S.C. Alfieri, I.Y. & D.A. Dias. A new heptasubstituted (E)-aurone glucoside and other aromatic compounds of *Gomphrena agrestis* with biological activity. *Z Naturforsch [C].* 59(7-8):499-505 (2004).
- 54) A.B. Pomilio, G.A. Solá, A.M. Mayer & L.S. Antitumor and cytotoxic screen of 5,6,7-trisubstituted flavones from *Gomphrena martiana*. *J Ethnopharmacol.* 44(1):25-33 (1994).
- 55) A.B. Pomilio, C.A. Buschi, C.N. & A.A. Viale. Antimicrobial constituents of *Gomphrena martiana* & *Gomphrena boliviana*. *J Ethnopharmacol.* 36(2):155-61 (1992).
- 56) M.M. Rosário, G.R. Noleto, J.F. Bento, F. Reicher, M.B. Oliveira & C.L. Petkowicz. Effect of storage xyloglucans on peritoneal macrophages. *Phytochemistry.* 69(2):464-72 (2008).
- 57) M. Abdel-Kader, J.M. Berger, C. Sledbodnick, J. Hoch, S. Malone, J.H. Wisse, M.C. Werkhoven, S. Mamber & D.G. Kingston. Isolation and absolute configuration of ent-Halimane diterpenoids from *Hymenaea courbaril* from the Suriname rain forest. *J Nat Prod.* 65(1):11-5 (2002).

- 58) J. Jakupovic, E. Ellmauerer, Y. Jia, F. Bohlmann, X.A. Dominguez & G.S. Hirschmann Further Eudesmane Derivatives from *Verbesina* Species. *Planta Med.* **(1)**:39-42 (1987).
- 59) SIRE-CONABIO-CONAFOR. *Crescentia cujete* L. Paquete tecnológico. Available at <http://www.conafor.gob.mx/portal/docs/secciones/reforestacion/Fichas%20Tecnicas/Crescentia%20cujete.pdf> . Accessed August 18, 2008.
- 60) Anonymous. *Crescentia cujete* L. Cujete. Available at <http://www.bpi.da.gov.ph/Publications/mp/pdf/c/cujete.pdf> . Accessed August 18, 2008.
- 61) T. Kaneko, K. Ohtani, R. Kasai & K. Yamasaki. n-Alkyl glycosides and p-hydroxybenzoyloxy glucose from fruits of *Crescentia cujete*. *Phytochemistry-Oxford.* **47** (2): 259-263 (1998).
- 62) J. Niño. Extractos vegetales con actividad sobre cepas mutadas de *Saccharomyces cerevisiae* con deficiencia en el mecanismo de reparación del ADN. *Scientia et Technica.* Año XIII **(33)**:431-433.
- 63) C. Huerta. La Herbolaria: Mito o realidad. Available at <http://www.maph49.galeon.com/biodiv2/herbo1.html> ; Accessed August 18, 2008.
- 64) A.L. Rüdiger, A.C. Sianib & V.F. Veiga, Jr. The Chemistry and Pharmacology of the South America genus *Protium* Burm. f. (Burseraceae). *Pharmacognosy Reviews.* **1(1)**:93-104 (2007).
- 65) R.J. Case, A.O. Tucker, M.J. Maciarelo & K.A. Wheeler. Chemistry and ethnobotany of commercial incense copals, copal blanco, copal oro, and copal negro, of North America. *Economic Botany.* **57** (2):189-202 (2003).
- 66) H.J. Langenheim. Plant Resins: Chemistry, Evolution, Ecology and Ethnobotany. Timber Press. (2003).
- 67) P. Faucon. *Heliocereus* Available at <http://www.desert-tropicals.com/Plants/Cactaceae/Heliocereus.html>; Accessed November 17, 2008.