Native Plants from Mexico Used in Herbal Products

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Historically, herbal products were the first resource used by man for the improvement of his health. It is the knowledge of these products that perpetuated medicinal practices prevail today as well. Mexico ranks fifth among megadiverse countries as it is home to nearly 23,424 vascular plants, which represent 5000 endemic plant species; of these, a total of 4500 medicinal plants have been estimated, while only 3000 are registered in the herbarium of the Mexican Institute of Social Security (IMSS). However, a pharmacological analysis of only 5% has been reported. The country boasts a wide range of medicine made from plants that are representative of traditional Mexican herbal products. There has been a steady rise in the use and commercialization of herbal products, demonstrative of the increase in world demand in this industry. Further, 90% of the population in Mexico has opted for these products at least once in their lives, as indicated by the Secretaría de Salud (SS) and Comisión Federal para la Protección contra Riesgos Sanitarios (COFEPRIS).

sanitary registries popular medicinal plants medicinal remedies medicinal plants

1. Native Plants from Mexico Used in Herbal Products

The most popular medicinal plants used for herbal medicines are native plants from other regions of the world, mostly Europe and Asia. Out of 241 sanitary registries, only 3 plants are native to Mexico, according to COFEPRIS [1]. On the contrary, for herbal remedies, it was observed that of 129 sanitary registries, at least 21 plants are native Mexican.

The research of popular medicinal plants of herbal products elicited 24 native plants from Mexico: *Persea gratissima*, *Phaseolus vulgaris*, *Sambucus, Cecropia obtusifolia*, *Smilax cordifolia*, *Tilia Mexicana*, *Tecoma stans*, *Turnera diffusa*, *Jacobinia spicigera*, *Ipomoea purga*, *Artemisa mexicana*, *Capsicum annum*, *Guazuma ulmifolia*, *Crescentia alata*, *Sambucus mexicana*, *Equisetum*, *Salix taxifolia*, *Amphipterygium adstringens*, *Hintonia latiflora*, *Conyza filaginoides*, *Coutarea latiflora*, *Eryngium heterophyllum*, *Ternstroemia pringlei*, and *Agastache mexicana*.

2. General Characteristics of Mainly Native Plants from Mexico Used in Herbal Products

This research presents information collected from scientific reports on the biological properties of plants with the highest number of registers for herbal medicine and herbal remedies (**Table 1** and **Table 2**) *Persea grattisima, Phaseolus vulgaris, Sambucus*, *Agastache Mexicana*, *Amphipterygium adstringens, and Turnera diffusa* and their

potential therapeutic applications. The bioactivities and mechanism of action reported in the literature on the plants are described below, considering that regulation did not require evidence for the registration of these products.

Table 1. Native plants used in herbal medicines with mainly biological activity and number of registers.

Herbal Medicine	Status	Biological Activity	Registers	Reference
Persea gratissima	Native	Antiartritic,	1	[2]
Phaseolus vulgaris	Native	Hypoglycemic, Antihyperlipidemic	1	[3]
Sambucus	Native	Respiratory diseases	1	[4]

Table 2. Native plants used in herbal remedies with mainly biological activity and number of registers.

Herbal Remedies	Status	Biological Activity	Registers	Reference
Cecropia obtusifolia	Native	Hypoglycemic	2	[5]
Smilax cordifolia	Native	Antihyperlipidemic, anti-inflamatory	2	[6]
Tilia mexicana	Native	Sedative, anxiolytic	1	[7]
Tecoma stans	Native	Digestive functions	3	[8]
Turnera diffusa	Native	Aphrodisiacs	4	[9]
Jacobinia spicigera	Native	Respiratory diseases	1	[10]
Ipomea purga	Native	Heart disease	1	[11]
Artemisa mexicana	Native	Digestive functions	1	[12]
Capsicum annum	Native	Digestive functions	2	[13]
Guazina ulmifolia	Native	Digestive functions	1	[14]
Crescentia alata	Native	Respiratory diseases	1	[15]
Sambucus mexicana	Native	Respiratory diseases	1	[16]
Equisetum	Native	Nefropatia	3	[17]
Salix taxifolia	Native	Nefropatia	1	[18]
Amphipterygium adstringens	Native	Digestive functions	7	[19]
Hintonia latiflora	Native	Digestive functions	2	[20]
Conyza filaginoides	Native	Digestive functions	3	[21]
Coutarea latiflora	Native	Digestive functions	1	[22]

Herbal Remedies	Status	Biological Activity	Registers	Reference
Eryngium heterophyllum	Native	Antihyperlipidemic	1	[23]
Ternstroemia pringlei	Native	Insomnia	1	[24]
Agastache mexicana	Native	Anti-inflamatory	9	[25]

prescribed for osteoarthritis. The oil enhances the synthesis of collagen and proteoglycan and decreases the synthesis of fibronectin. Another mechanism of action is the inhibition of the release and activity of metalloproteinases and proinflammatory cytokines such as IL-1, IL-8, and PGE2 [26][27][28]. Additionally, in vitro studies have shown that the oil mixture stimulates aggrecan and matrix component synthesis, reduces catabolic and proinflammatory mediator production, and appears to prevent the osteoarthritic osteoblast-induced inhibition of matrix molecule production, suggesting that this compound may promote osteoarthritis cartilage repair by acting on subchondral bone osteoblasts [26].

The clinical data suggest that unsaponifiable oil from avocado and soybean can efficiently supplement long-term treatments of knee and hip osteoarthritis [26][28][29].

2.2. *Phaseolus vulgaris*

The seed of this plant (beans) has been investigated for several bioactivities. One of them is the inhibitor of alpha-amylase, which has anti-obesity effects, as well as the ability for reducing post-prandial peaks from blood glucose in clinical trials [7] and facilitates digestion and prevents constipation [30][31]. Otherwise, inhibition in vivo of maltase and saccharase was reported in rats [32].

2.3. *Sambucus*

Sambucus nigra flower (elderflower) and fruit (elderberry) extract, which is prescribed for flu symptoms, have demonstrated ancestral medicinal properties even for respiratory viral pathogens, such as influenza and cold. The elderflowers are composed of a diversity of bioactive molecules such as free aglycones, flavonol glycosides, phenolic compounds, sterols, triterpenes, free fatty acids, alkanes, and tannins. Antiviral activity has been tested against dengue virus serotype-2, influenza, herpes simplex virus type 1, parainfluenza, influenza, and respiratory syncytial virus. However, reports of clinical trials demonstrating the efficacy of elderflower extract do not exist, even though four trials exist that use elderberry extracts [33][34][35].

2.4. *Agastache mexicana*

A. mexicana is a Mexican medicinal plant commonly known as “toronjil morado.” It is an endemic plant in Mexico that is prepared as an infusion or decoction, also maceration in ethanol of aerial parts. The biological activity is used for treating nervous system issues, insomnia, cardiovascular disorders, and gastrointestinal diseases [36][37][38]. The major compounds in this medicinal specie are monoterpenes such as limonene and pulegone [39]. The anti-inflammatory activity of limonene has been demonstrated, while the nociceptive behavior of pulegone has been reported [40][41]. Recent scientific evidence showed that the compounds present in the medicinal plant *A.*

mexicana can reduce symptoms such as pain and inflammation in gastrointestinal disorders, implying the potential use of the monoterpenes present in the plant for therapeutic purposes and treatment of abdominal pain, colitis, and ulcers [38].

2.5. *Amphipterygium adstringens*

Commonly known as “Cuachalalate”, it is a dioecious tree endemic to Mexican tropical dry forests [42]. The biomedical properties have been extensively studied, including astringent and hypocholesterolemic properties, as well as their effectiveness for treating cancer and gastritis. The bark has traditionally been used by healers to treat gastritis, gastric ulcers, gastrointestinal cancer, colic, fever, and also tooth pain. The phytochemical constituents of Cuachalalate bark are categorized into two main groups: triterpenes and long-chain phenolic compounds [43]. In particular, *A. adstringens* have a high commercial demand in Mexico [44]; 57.5 tons of bark per year are estimated in south-central Mexico [45]. In a recent report, the researchers demonstrated that the extract of *A. adstringens* (“cuachalalate”) has substantial potential for the treatment of inflammatory colitis [46].

2.6. *Turnera diffusa*

Turnera diffusa, commonly known “damiana”, is a shrub that grows in arid and semiarid regions of South America, Mexico, the United States, and the West Indies. Several properties have been attributed to this plant. Usually, the leaves of the plant are used to prepare a decoction [47][48]. Phytochemical investigations have been conducted to isolate and identify some components present in the plant, among which are flavonoids, sesquiterpenes, triterpenes, polyterpenes, fatty acids, and xanthine-derived sugars [9][49]. In a recent study, methanolic extract of *T. diffusa* was demonstrated to have an antidiabetic effect of Teuhetenone A in a diabetic mice model [50].

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