

Prosopis Plant

Subjects: **Biology**

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Members of the *Prosopis* genus are native to America, Africa and Asia, and have long been used in traditional medicine. The *Prosopis* species most commonly used for medicinal purposes are *P. africana*, *P. alba*, *P. cineraria*, *P. farcta*, *P. glandulosa*, *P. juliflora*, *P. nigra*, *P. ruscifolia* and *P. spicigera*, which are highly effective in asthma, birth/postpartum pains, callouses, conjunctivitis, diabetes, diarrhea, expectorant, fever, flu, lactation, liver infection, malaria, otitis, pains, pediculosis, rheumatism, scabies, skin inflammations, spasm, stomach ache, bladder and pancreas stone removal. Flour, syrup, and beverages from *Prosopis* pods have also been potentially used for foods and food supplement formulation in many regions of the world. In addition, various in vitro and in vivo studies have revealed interesting antiplasmodial, antipyretic, anti-inflammatory, antimicrobial, anticancer, antidiabetic and wound healing effects. The phytochemical composition of *Prosopis* plants, namely their content of C-glycosyl flavones (such as schaftoside, isoschaftoside, vicenin II, vitexin and isovitexin) has been increasingly correlated with the observed biological effects.

Prosopis

vitexin

C-glycosyl flavones

food preservative

antiplasmodial

wound healing potential

1. Introduction

Medicinal plants have been used since the beginning of human civilization to treat various diseases. Different properties have been discovered for each plant, due to many researchers' focus on plants as a natural resource for treating human health [1][2]. Of the various medicinal plants, species belonging to the *Prosopis* genus have been widely used in folk medicine. The *Prosopis* genus belongs to the Fabaceae or Leguminosae family, and includes about 45 species of spiny trees and shrubs. This genus is found in both subtropical and tropical areas of the world. Briefly, species belonging to the *Prosopis* genus have been traditionally used for the treatment of asthma, birth/postpartum pains, callouses, conjunctivitis, diabetes, diarrhea, expectorant, fever, flu, lactation, liver infection, malaria, otitis, pains, pediculosis, rheumatism, scabies, skin inflammations, spasm, stomach ache, removal of bladder and pancreas stones, among other applications [3][4][5]. On the other hand, in addition to being used for centuries for medicinal purposes *Prosopis* plants are also of commercial interest. The paste, gum, and leaves and pods smoke of *Prosopis* plants possess various bioactive properties, such as anticancer, antidiabetic, anti-inflammatory, antimicrobial and antioxidant effects [6][7][8]. These effects have been increasingly correlated with their content in phytoconstituents, namely flavonoids, tannins, alkaloids, quinones and phenolics. Indeed, *Prosopis* plants have been reported as a rich source of phenolic compounds, being anthocyanins and the flavonoids apigenin, luteolin, quercetin and their derivatives the most abundant ones [9][10][11].

Thus, and given the above highlighted aspects, the aim of this review is to provide an in-depth overview of the literature data on the biological activities of the *Prosopis* genus, and to present its potential benefits and applications in both the pharmaceutical and food industries.

2. *Prosopis* Plants Phytochemical Composition

Epidemiological studies have suggested an inverse association between the consumption of phytochemicals (such as carotenoids and phenolics) and a reduced risk of certain diseases, namely chronic disorders [12]. Medicinal plants, and specifically *Prosopis* plants, are rich sources of phytochemicals, among them alkaloids, phenolic compounds, particularly flavonoids (Figure 1; Figure 2) and phenolic acids (Figure 3), glycosides, steroids, tannins and triterpenoids, increasingly recognized as having positive health effects.

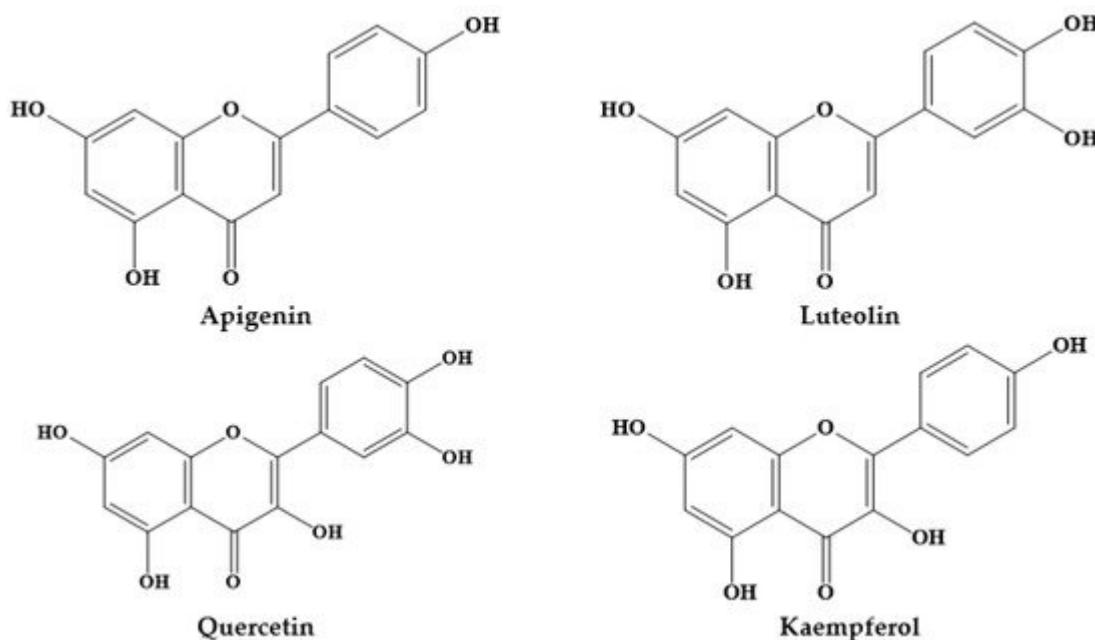


Figure 1. Structures of the main flavonoids in *Prosopis* plants.

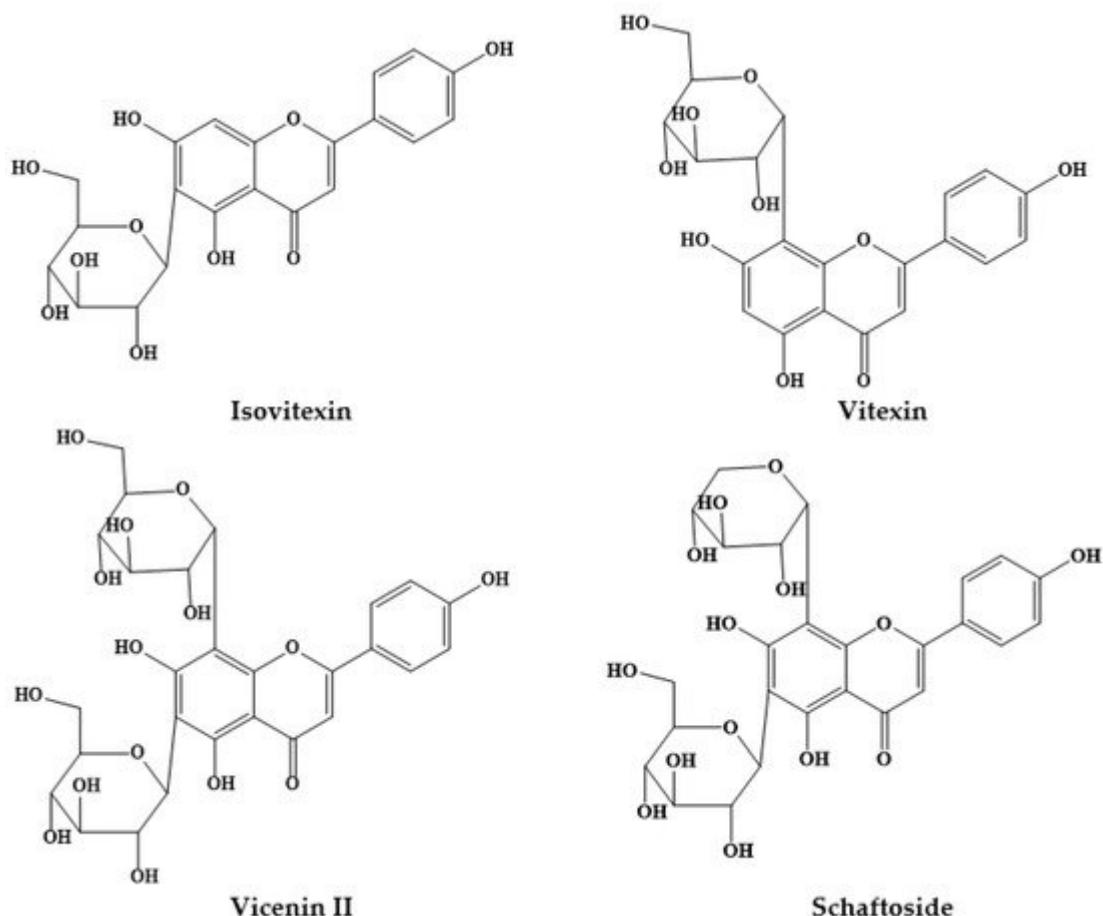


Figure 2. Structures of some C- glycosyl flavones from *Prosopis* plants.

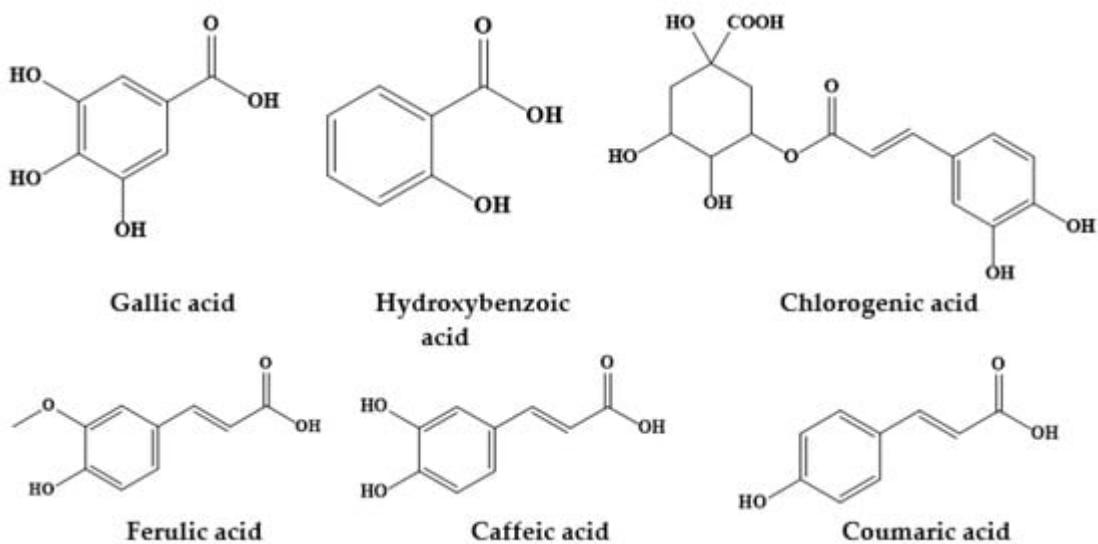


Figure 3. Chemical structures of some phenolic acids from *Prosopis* plants.

Several studies have been conducted to identify and quantify the chemical composition of *Prosopis* plants. The most commonly studied plants and their abundance in phytochemicals are listed in **Table 1**.

Table 1. Identification/quantification of phytochemicals in *Prosopis* species.

Prosopis Plant and Part	Identified/Quantified Phytochemicals	References
<i>P. alba</i> flours	Isovitetxin (1.12–0.48 µg/mg)	
	Vicenin II (1.07–0.34 µg/mg)	
	Vitexin (0.91–0.47 µg/mg)	
	Schaftoside (0.42–0.00 µg/mg)	[9]
	Ferulic acid (4.01–0.28 µg/mg)	
	Coumaric acid (3.94–0.33 µg/mg)	
	Q-dihexoside rhamnoside	
	Q-dihexoside	
	Q-methylether dihexoside	
	Vitexin	
<i>P. alba</i> pods	Q-rhamnoside hexoside	[10]
	Isovitetxin	
	Q-hexoside	
	K-hexoside	
	Isoschaftoside hexoside (2.43 mg/g)	
	Schaftoside hexoside (3.33 mg/g)	
<i>P. alba</i> flour	Vicenin II/Isomer (0.67 mg/g)	
	Vicenin II/Isomer (2.34 mg/g)	[13]
	Isoschaftoside (23.67 mg/g)	
	Schaftoside (14.86 mg/g)	
	Vitexin (0.46 mg/g)	
<i>P. alba</i> exudate gum	Isovitetxin (2.09 mg/g)	
	Ferulic acid 4-glucuronide (E)	[11]
	Apigetin, chrysin (E)	

Prosopis Plant and Part	Identified/Quantified Phytochemicals	References
<i>P. nigra</i> pods	Chlorogenic acid (E and NE) 3-O-feruloylquinic acid (E) p-Coumaroylquinic acid (E) Valoneic acid dilactone (E) Digallic acid (E) Ferulic acid (NE) Esculetin derivative (NE) 7-O-Methylapigenin (NE) Cyanidin rhamnosyl hexoside Cyanidin-3-hexoside Peonidin-3-hexoside Malvidin dihexoside Cyanidin malonoyl hexoside Petunidin-3-hexoside Malvidin rhamnosyl hexoside Malvidin-3-hexoside Vicenin II Q-dihexoside rhamnoside Isoschaftoside Q-dihexoside Schaftoside Q-hexoside rhamnose K-hexoside rhamnoside Isovitetin Q-hexoside	[10]

Prosopis Plant and Part	Identified/Quantified Phytochemicals	References
	K-hexoside	
	Apigenin hexoside rhamnoside	
	Q methyl ether hexoside rhamnoside	
	K-methyl ether hexoside rhamnoside	
	Vicenin II (0.34 µg/mg)	
	Schaftoside (0.24 µg/mg)	
	Isoschaftoside (0.27 µg/mg)	
<i>P. nigra</i> flour	Isovitexin (0.81 µg/mg)	[14]
	Protocatechuic acid (0.33 µg/mg)	
	Coumaric acid (8.16 µg/mg)	
	Ferulic acid (4.47 µg/mg)	
	Protocatechuic acid (31.65 mg/g) Chlorogenic acid (22.31 mg/g)	
	Caffeic acid (6.02 mg/g)	
	Ferulic acid (9.24 mg/g)	
	Prosogerin A, B, C and D	
	β-sitosterol	
<i>P. cineraria</i>	Hentriacontane	[15][16][17]
	Rutin	
	Gallic acid	
	Patulitrin	
	Luteolin	
	Spicigerin	
<i>P. laevigata</i>	Gallic acid (8–25 mg/100 g)	[18]
	Coumaric acid (335–635 mg/100 g)	
	Catechin (162.5 mg/100g)	

Prosopis Plant and Part	Identified/Quantified Phytochemicals	References
	Gallocatechin (340–648 mg/100 g)	
	Epicatechin gallate (10–71 mg/100 g)	
	Rutin (222.4–256.1 mg/100 g)	
	Morin (236.5 mg/100 g)	
	Naringenin (20 mg/100 g)	
	Luteolin (13 mg/100 g)	
	4'-O-Methylgallocatechin	
	(+)-catechins	
	(-)-mesquitol	
	Apigenin	
	Luteolin	
	Apigenin-6,8-di-C-glycoside	
<i>P. juliflora</i>	Chrysoeriol 7-O-glucoside	[19][20]
	Luteolin 7-O-glucoside	
	Kaempferol 3-O-methyl ether	
	Quercitin 3-O-methyl ether	
	Isoharmentin 3-O-glucoside	
	Isoharmentin 3-O-rutinoside	
	Quercitin 3-O-rutinoside	
	Quercitin 3-O-diglycoside	
<i>P. glandulosa</i>	Gallic acid (8.203 mg/g)	[21]
	Hydroxybenzoic acid (1.797 mg/g)	

Scientific Name	Location	Local Name	Parts Used	Administration	Treated/Bioactive Effects	References
<i>P. africana</i>	Sélingué subdistrict, Mali	Guele	Bark trunk	Oral, Bath	Malaria	[19]
	Guinea-Bissau	Tentera, Buiengué, Bussagan, Coquengue	Leaves, bark, roots	Unspecified	Pains, pregnancy (childbirth, breastfeeding, diseases of the	[20]

Scientific Name	Location	Local Name	Parts Used	Administration	Disease(s) Treated/Bioactive Effects	References
<i>P. alba</i>	Nsukka Local Government Area, South-eastern Nigeria	karbon, Késeg-késeg, Paucarvão, Pócarvão, Pó-de-carbom, Podi-carvom, Tchelem, Tchalem-ai, tchela, Tchelangadje, Tchelem, Bal-tencali, Culengô, Culim-ô, Djandjam-ô, Quéssem-quéssem, Djeiha, Ogea		newborn), skin inflammations (wounds, burns)		[21]
<i>P. cineraria</i>	North-West Nigeria	Ugba	Leaf	Oral	Malaria	[21]
	Wichí people of Salta province, Argentina	Kirya, Ko-hi	Roots	Oral	Analgesic, anti-inflammatory	[22]
		Jwaayukw, Algarrobo blanco	Resin	Oral	Conjunctivitis, post-abortion pain	[23]
<i>P. cineraria</i>	Bahawalnagar, Punjab, Pakistan	Drucey	Leaves, stem	Oral	Spasm, diabetes, liver infection, diarrhea, removal of bladder and pancreas stone, fever, flu	[5]
	Thar Desert (Sindh), Pakistan	Gujjo	Fruit	Oral	Rheumatism	[13]
	South of Kerman, Iran	Kahour	Fruit	Topical	Asthma, skin rash	[14]

Scientific Name	Location	Local Name	Parts Used	Disease(s) Treated/Bioactive Effects		
				Administration	References	
	Pakistan	Unspecified	Flower	Oral	Rheumatism	[15]
	Hafizabad district, Punjab, Pakistan	Jhand	Leaf, bark, stem, flower, fruit	Oral, topical, eye drop	Liver tonic, boils and blisters, scorpion bite, pancreatic stone, leucorrhoea, chronic dysentery, cataract	[3]
	Pakistan	Unspecified	Fruit, pods	Unspecified	Asthma	[4]
	Pakistan	Jandi, Kanda, Kandee, Jhand	Leaves, Bark, Flowers, Pods and wood	Oral	Menstrual disorders, contraceptive, prevention of abortion	[16]
<i>P. farcta</i>	Jahrom, Iran	Kourak	Fruit	Oral	Constipation, febrifuge	[24]
<i>P. glandulosa</i> Torr	Bustamante, Nuevo León, Mexico	Mezquite	Inflorescences	Oral	Stomach pain	[25]
	Thar Desert (Sindh), Pakistan	Devi	Leaves, Gum	Oral	Painkiller, boils opening, eye inflammation, body tonic, muscular pain	[13]
<i>P. juliflora</i>	Hafizabad district, Punjab, Pakistan	Mosquit pod	Whole plant, Flower, Stem, Leaves, Bark	Oral, topical, and as toothbrush	Galactagogue, kidney stones, toothache, breast cancer, asthma, boils	[3]
	Pakistan	Unspecified	Xerophytic shrub	Unspecified	Asthma, cough	[4]
	Mohmand Agency, FATA, Pakistan	Kikrye	Leaves	Oral	Lactation, expectorant	[17]
	Western Madhya Pradesh, India	Reuja	Stem bark	Oral	Asthma	[18]

3.1. PROSOPIS CINERARIA

P. cineraria is traditionally used as a medicine in different regions of Pakistan, including Bahawalnagar in Punjab Province, the Thar Desert (Sindh) and Hafizabad district in Punjab (Table 2). The oral or topical administration of *P. cineraria* leaves, stems, fruits, flowers, barks and pods is used for the treatment of spasms, diabetes, liver infection, diarrhea, bladder and pancreas stones, fever, flu, rheumatism, leucorrhoea, boils, blisters, scorpion bite, chronic dysentery, cataract, asthma, sexually-transmitted infections, and gynecological complaints, including

Scientific Name	Location	Local Name	Parts Used	Administration	Disease(s) Treated/Bioactive Effects	References
<i>P. nigra</i>	Wichí people of Salta province, Argentina	Wosochukw, Algarrobo negro	Resin	Oral	Ocular trauma, conjunctivitis	[23]
<i>P. ruscifolia</i>	Wichí people of Salta province, Argentina	Atek, Vinal	Leaves	Oral	Conjunctivitis, stomachache, pimples/rash, scabies, callouses, fever, birth/postpartum pains, diarrhoea, pediculosis, otitis	[23]
<i>P. spicigera</i>	Pakistan	Unspecified	Bark, leaves, flowers	Unspecified	Asthma	[4]

P. africana is commonly known as African mesquite, and is also traditionally used as a medicine. The oral administration of leaves and bark of this plant is used for the treatment of malaria in Sélingué subdistrict in Mali [19] and Nsukka Local Government Area in south-eastern Nigeria [21].

In addition to malaria, various parts of *P. africana*, including roots, leaves and bark, are also used as analgesic and anti-inflammatory in Guinea-Bissau [22] and for the treatment of pains, pregnancy-related conditions (childbirth, breastfeeding, newborn diseases), and skin inflammations (i.e., wounds, burns) in north-west of Nigeria [20].

3.4. Other Prosopis Plants

The resin of *P. alba* and *P. nigra*, and the leaves of *P. ruscifolia* have also been consumed by the Wichí people of Salta province in Argentina against conjunctivitis, post-abortion pain, ocular trauma, stomachache, pimples or rash, scabies, callouses, fever, birth or postpartum pains, diarrhea, pediculosis and otitis [23].

A study carried out in South America (Bustamante, Nuevo León, Mexico), also pointed out that the ingestion of *P. glandulosa* inflorescences may be useful to relief stomach pain [25]. In addition to the above, in Jahrom, Iran, *P. farcta* fruits have been consumed to prevent constipation and to reduce fever [24], whereas *P. spicigera* bark, leaves and flowers are used for the treatment of asthma in Pakistan [4].

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