

SAPONINS

Saponins is a group of natural organic compounds, which due to their chemical structure appear to be glycosides, possessing high surface activity. They destroy red blood corpuscles (haemolysis) and are toxic to cold-blood animals (e.g. fishes and frogs).

The name of this group of compounds comes from latin word "sapo" - it means soap-like. At first the term "saponin" was suggested by Malon in 1819 for a substance, isolated from soapwort by Scheidler in 1811.

Saponins form a colloidal solution in H₂O that foam upon shaking. They have bitter, acrid taste and are usually sternutatory or irritant to mucous membrane.

Distribution of Saponins

Saponins are widely distributed in the plant world. The presence of saponins has been reliably established in 70 plant families. Steroidal saponins are found in plants of families: Liliaceae, Amaryllidaceae, Dioscoreaceae, Schrophulariaceae, Zygophyllaceae etc.

Triterpenoid saponins are spread broader than steroidal ones. They are found in 150 genera. The majority of triterpenoidal saponins are met in the families: Fabaceae, Caryophyllaceae, Asteraceae, Equisetaceae, Araliaceae, primulaceae, Polygonaceae, Violaceae, Lamiaceae etc.

Classification and Structure of Saponins

Saponins have a high molecular weight and their isolation in a state of purity presents some difficulties. Upon hydrolysis, they yield an aglycone known as a sapogenin and a sugar part.

The sapogenin portion could be either triterpenoidal (C-30) or steroidal (C-27).

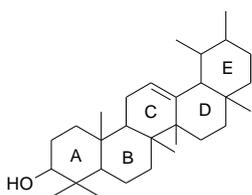
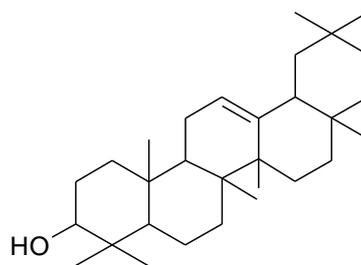
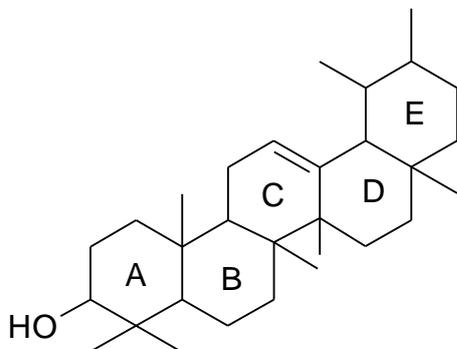
Saponin molecules have a hydrophobic/hydrophilic asymmetry due to aglycone portion and sugar portion, respectively. This character results in lowering surface tension in aqueous solution and foaming on shaking.

Saponins are glycosylated at C-3, and sometimes, the alkyl side chain is changed into a COOH group, which may be esterified by a sugar portion. Sugar parts of saponins are often containing uronic acid or acyl residues.

Triterpenoidal Saponins May be Classified into Two Groups:

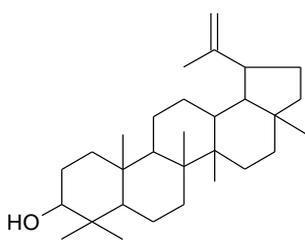
1. saponins, whose aglycones are represented by pentacyclic compounds (α -amyrin, β -amyrin and lupeol).
2. saponins, whose aglycones are represented by tetracyclic compounds (derivatives of damaran)

Pentacyclic Triterpenoid Types of Saponins

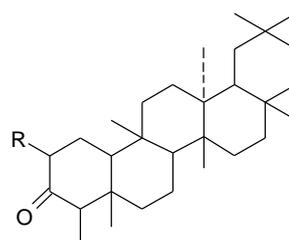


α -amyrin

β -amyrin

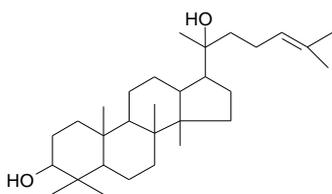


lupeol

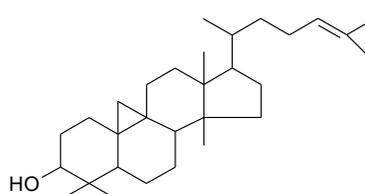


fridelin (cerin)

Tetracyclic triterpenoid types of saponins



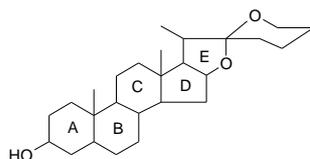
damaran



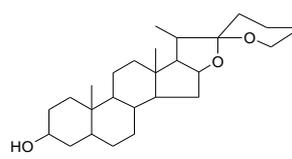
cycloortan

Steroidal Saponins

1. Spirostanol saponins

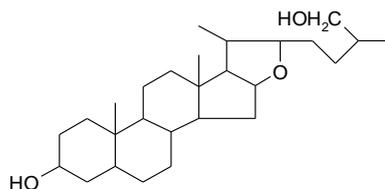


nonodesmosid normal line



monodesmosid iso-line

2. Furostanol type



Molecules of saponins as other glycosides consist of carbohydrate part and aglycone, which is called sapogenin. Saponins may be containing from 1 to 11 monosaccharides and their derivatives. D-glucose, D-galactose, D-xylose, L-rhamnose, D-glucuronic and D-galacturonic acids are the most common. They form linear or branched chains, and may join by means of hydroxyl and carboxyl groups to aglycones in various positions.

Physico-Chemical Properties

Saponins are colorless or yellowish amorphous substances without typical temperature of melting. Saponins are readily soluble in water, soluble in hot 80-90% ethyl alcohol, in dilute 60-70% ethyl and methyl alcohols, poorly soluble in strong ethyl and methyl alcohols, insoluble in organic solvents (ether, chloroform, acetone, benzene). The more molecules of sugar in hydrocarbon part, the higher their solubility in water.

Sapogenins (aglycones of saponins) are readily soluble in organic solvents and insoluble in water.

Saponins are substances, possessing strong surface activity that is connected with presence of both hydrophilic and hydrophobic residues in one molecule. Saponins are optically active substances. Saponins have a high molecular weight.

Saponins interact and form molecular complexes with sterins (cholesterol), proteins, lipids, tannins.

From alcohol solutions saponins are precipitated by ether, acetone and ethylacetate.

Steroidal saponins are neutral compounds. Triterpenoidal saponins and sapogenins are divided into neutral and acidic ones.

Acidic saponins form soluble salts with monovalent metals and insoluble compounds with two-or polyvalent metals, salts of lead, copper.

They are soluble in aqueous solutions of alkalis and fall out in residue on acidification.

Saponin Isolation Methods

1. The plant material is extracted either with water or methanol, or aqueous methanol, under reflux.
2. The extract is concentrated, followed by precipitation with:
 - Ether, or acetone.
 - Lead acetate in case of **acidic saponins**
 - Or basic lead acetate in case of **neutral saponins** followed by decomposition with acid.
3. Separate the individual saponin glycosides by using different chromatographic methods.

Qualitative Tests for Saponin Glycosides

Qualitative reactions on saponins are divided into three groups:

1. Reactions, which are based on physical properties of saponins - Froth test.
2. Reactions, which are based on biological properties – Haemolysis test.
3. Reactions, which are based on chemical properties of saponins:
 - a) reaction with 10% of basic and neutral acetate of lead; in the presence of triterpenoidal saponins residue with the neutral acetate of lead is formed and in the presence of steroidal ones- with the basic acetate of lead.
 - b) reaction with 10% solution of sulphate of copper, residue of brick-red colour is formed.
 - c) reaction with hydrate of barium oxide: residue of white colour is formed;
 - d) reaction with 1% alcohol cholesterol solution-a residue is formed.

To the colour reactions on saponins belong the following reactions:

Steroidal saponins give this reaction.

- a) reaction of Liberman-Burhard: a dry residue of the extract is dissolved in acetic acid and mixture of acetic anhydride and concentrated sulfuric acid is added. After that the colouring changes from pink through green to blue.
- b) reaction with chlorohydrate and concentrated sulfuric acid; a yellow ring is formed, which becomes purple-red, then purple.
- c) reaction of Laphon (with concentrated sulfuric acid, ethyl alcohol and 10% solution of sulfuric acidic iron-blue-green colouring is formed.

d) reaction with 1% of sodium nitrite and concentrated sulfuric acid; blood-red colouring is formed.

For qualitative identification of saponins chromatography on paper is used. Thin layers of sorbent chromatography are also used.

Quantitative Determination of Saponin Glycosides

1. Gravimetric Method: The saponin glycosides are precipitated using saturated Ba(OH)₂ solution, the resulted complex is filtered and the precipitate is dried and weighed to constant weight. The residue is then ignited and weight after ignition, then subtract the weight after ignition from the original weight to give weight of saponin content.

2. Foam Index: It defines the dilution of the drug, that gives a layer of foam 1 cm height, when an aqueous solution is shaken in a graduated cylinder for 15 seconds after 15 min standing.

3. Fish Index: It is reciprocal of the dilution that kills 60 % of the fish in one hour.

4. Haemolytic Index: It is the greatest dilution of saponin solution that produces total haemolysis.

Uses of Saponins

1. Steroidal sapogenins are used in production of cortisone and sex hormones (partial synthesis).
2. Saponins showed diverse array of medicinal uses such as expectorant, immunostimulant, and in control of schistosomiasis snails.
3. Saponins are used in cleaning industrial equipment and fine fabrics.
4. They are used as powerful emulsifier.

Medicinal Plants and Raw Material Containing Saponins

Triterpenoidal Saponins



GINSENG ROOT - *GINSENG RADICES*

Ginseng- *Panax Ginseng* C.A. Mey, Fam. *Araliaceae*

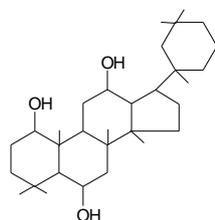
Synonyms. Five-fingers, Red berry, American Ginseng, Chinese Ginseng, Korean Ginseng, Oriental Ginseng.

Plant. The plant is a perennial, and stands erect from 30 to 80 cm high. It has a smooth, round stem and bears terminal whorls of 3 to 5 palmate leaves. The leaflets are thin, finely serrate, gradually acuminate, 7 to 20 cm long and 2 to 5 cm wide. The rhizome tapers at the ends and is often palmate at the tip, giving it a human-like form. The inflorescence is simple or branched with 1 to 3 umbels of 15 to 30 flowers. The flowers are "androgynous and have greenish-yellow corollas. The ovary is inferior. The fruit is a pea-sized, globular to reniform, scarlet, smooth and glossy drupe, which contains 2 seeds.

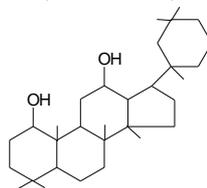
Area of distribution. *Panax ginseng* is indigenous to China. It is cultivated in China, Korea, Japan and Russia.

Description. Ginseng root occurs in rachis-like root, to 25 cm long with 2-5 large branching, rare without them. The body of the root is thickened, nearly cylindrical with clearly expressed ringed thickenings in the upper part. The outer surface is longitudinally, rare spirally wrinkled. Their colour is yellowish-white. The upper part of the root narrows into transverse wrinkled rhizome-root-collar. The rhizome is short with several scars of fallen-off stems. The rhizome is represented by extended traces of the stem and topical bud. The odour is specific, the taste is sweet, burning, then bitterish.

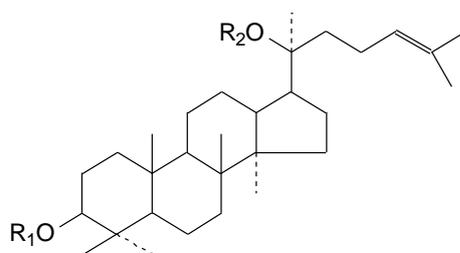
Constituents. Ginseng contains a complex mixture of triterpenoidal saponins. These glycosides have been categorized into 3 series, the panaxosides, the ginsenosides and the chikusetsusaponins. Some 13 ginsenosides (e.g. ginsenosides R_o, R_a, R_b, etc.) have been described. The panaxosides are termed panaxoside A, B, C etc. Ginseng root contains a mixture of both steroidal and pentacyclic triterpenoidal saponins. Other compounds of the root having therapeutic activity are high-molecular-weight polysaccharides; these are known as panaxans and they have been shown to have hypoglycaemic activity. Other constituents isolated include sterols, vitamins of the B groups, volatile oil, fixed oil, ferments.



Panaxatriol



Panaxadiol



Ginsenoside,

***R₁*=D-glucosa-glucosa,**

***R₂* = arabinosa - D - glucosa**

Uses. Ginseng is used internally for fatigue and debility, and for a decrease capacity for work and concentration. The drug is used for treatment of anemia, diabetes, gastritis, sexual impotence and sterility, neuralgia and insomnia.

Approved by Commission E: Lack of stamina.

Homeopathic Uses. Ginseng is used for rheumatism and debility.

Pharmacopoeial and Other Monographs: BHC 1992, BHP 1996, Complete German Commission E, Martindale 35th edition, Ph. Eur. 6.4, BP 2009, USP 32.



MARIGOLD FLOWER - CALENDULAE FLORES

Marigold - *Calendula officinalis* L., Fam. Asteraceae.

Synonyms. Calendula, Holligold, Goldbloom, Golds, Mary Bud, Ruddes, Mary Gowles, Holigold, Marybud.

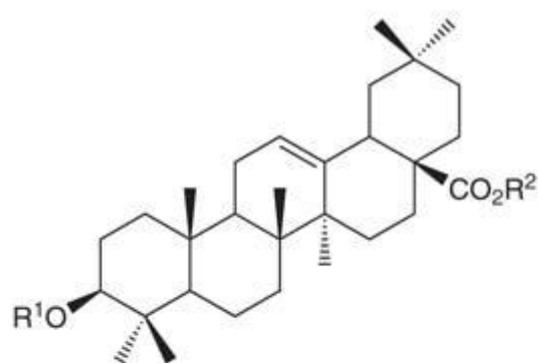
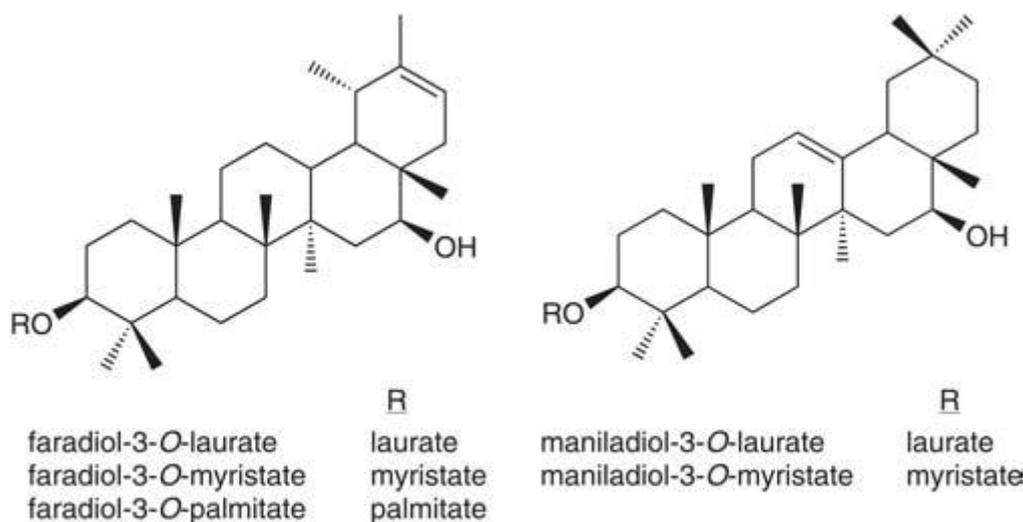
Plant. The plant is usually an annual, seldom biennial. It grows to between 30 and 50 cm high and has a 20 cm long tap root and numerous thin, secondary roots. The stem is erect, angular, downy and branched from the base up or higher. The alternate leaves are almost spatulate at the base, oblong to lanceolate above and are all tomentose. On the tip of each stem there is a 5 to 7 cm composite flower head consisting of an epicalyx of numerous narrow-lanceolate sepals, which are densely covered on both sides with glandular hairs. The inner section of the flower head is made up of orange-yellow tubular florets. The disc florets are pseudohermaphrodites; the female sterile. The zygomorphic ray florets at the edge are female, their stamens are completely absent, and their inferior ovaries are much more developed than those of the tubular florets only in the female ray flowers. The heterocarp achenes are sickle-shaped, curved and ringed.

Area of distribution. Central and southern Europe, western Asia and the USA.

Description. Marigold flowers are the ray florets of the completely unfolded, collected and dried capitula of *Calendula officinalis*. Harvest begins in July. Drying takes place in the shade at a maximum of 45° C. The commercial drug consists of the entire or partly broken-up flower-heads (diameter 5-7 cm), especially of double varieties with numerous ligulate florets and few tubular florets, and of individual florets free of the receptacle and involucre bracts. The yellowish red, shiny, female ligulate florets are characteristic; they are 20-30 mm long and 5-7 mm broad and they readily fade on keeping; at the top they are tridentate and they do not have a pappus. The odour is faint, but characteristic. The taste is somewhat bitter and salt.

Constituents. Triterpene saponins 2 to 10%: glycosides A to F (mono- or bisdemossidic oleanolic acid glycosides); Triterpene alcohols: triterpene monools (0.8%), triterpene dioles (4%) and triterpene triols, including lupeol, taraxasterol, psi-taraxasterol, faradiol, arnidiol, their mono- and diesters (chiefly acetic acid, lauric, myristic and palmitic acid as acid components); flavonoids 0.3 to 0.8%: including isorhamnetin and quercetin glycosides; hydroxycoumarins: including scopoletin, umbelliferone, esculetin; carotenoids: chief components lutein, zeaxanthine; volatile oil 0.2%: chief components α -cadinol, tcadinol; fatty acids; water-soluble polysaccharides 15%: rhamnoarabinogalactans, arabinogalactans; polyynes.

Saponins



Calendulosides

	R¹		R²
glucose (1→4)	glucuronic acid	glucose	
galactose (1→3)	glucuronic acid	H	
glucose (1→4)	glucuronic acid	glucose	
galactose (1→3)	glucuronic acid	H	
galactose (1→4)	glucuronic acid	H	
glucose (1→4)	glucuronic acid	H	
glucuronic acid		H	

Selected constituents of *Calendula*

Uses. Flavonoids isolated from flowers of *Calendula officinalis* demonstrated positive antimicrobial activity against *Staphylococcus aureus*. Other studies have demonstrated the flavones to be effective against *Klebsiella pneumoniae*, *Sarcina lutea* and *Candida monosa*. Organic extracts of the dried flowers of topical application of Calendula has been shown to enhance the granulation and epithelialization of damaged skin. Liquid extract, Calendula Tincture, Ointment 2.5%.

Homeopathic Uses. *Calendula officinalis* is used for frostbite burns to the skin and poorly healing wounds. The efficacy of the homeopathic uses has not been proven.

Pharmacopoeial and Other Monographs:BHP 1996, BP 2009, Complete German Commission E, ESCOP 2003, Martindale 35th edition, Ph. Eur. 6.4, WHO volume 1 1999.



LICORICE ROOT - *GLYCYRRHIZAE RADICES*

Licorice - *Glycyrrhiza glabra* L., Fam. Fabaceae.

Synonym(s): Sweet Root, sweet wort.

Plant. The plant is a herbaceous perennial. It is 1 to 2 m high and has a long sturdy primary taproot. The taproot is 15 cm long and subdivides into 3 to 5 subsidiary roots, 1,25 m in length. There are several horizontal woody stolons which may reach 8 m. New stems are produced every year. They are sturdy, erect, branched either from the base or from further up, and are generally rough at the top. The foliage leaves are alternate, odd pinnate and 10 to 20 cm long. The leaflets are in 3 to 8 pairs. The stipules are very small and drooping. The axillary inflorescences are upright, spike-like and 10 to 15 cm long. The individual flowers are 1 to 1,5 cm long, bluish to pale violet and short-pedicled. The calyx is short, bell-shaped and glandular-haired. The tips of the calyx are longer than the tube, and are pointed lanceolate. The petals are narrow, the carina petals are not fused, and they are pointed but not beaked. The fruit is a pod, 1,5 to 2,5 cm long, and 4 to 6 mm wide. It is erect and splayed, flat with thick sutures, glabrous, somewhat reticulate-pitted, and usually has 3 to 5 brown, reniform seeds.

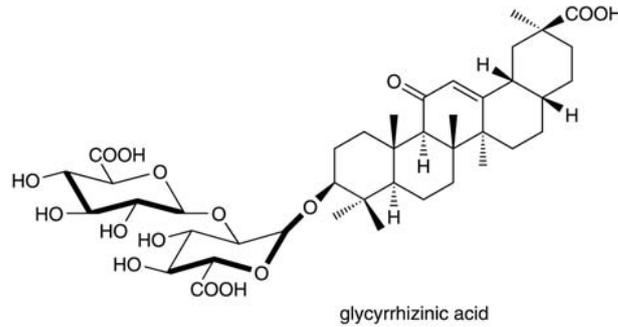
Area of distribution. Individual varieties of *Glycyrrhiza* are found in different regions. *Glycyrrhiza glanulifera* is found in southeastern Europe and western Asia. *Glycyrrhiza pallida* and *Glycyrrhiza violocea* are found in Iraq. *Glycyrrhiza typica* is indigenous to southern Europe and southwest Asia.

Description. It consists generally of roots in nearly cylindrical pieces, up to 1 m long and 5-20 mm in diameter; externally, the bark is brownish grey to dark brown, longitudinally wrinkled, occasionally bearing small dark buds in rhizomes or small circular or transverse rootlet-scars in roots. The peeled root is yellow, smooth, fibrous, finely striated; fracture, fibrous, in the bark and splintery in the wood; internally, bright yellow. A distinct cambium ring separates the yellowish grey bark from the finely radiate yellow wood. The fracture of roots is fibrous, yellow in colour. The odour is absent, the taste is sickly-sweet.

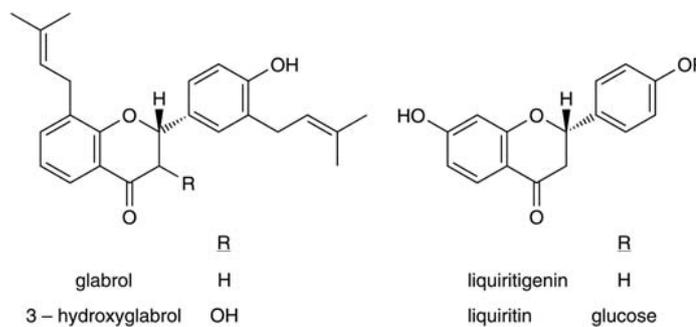
Constituents. Triterpene saponins (3-15%): chief components glycyrrhetic acid (sweet-tasting, aglycone 18beta-glycyrrhetic acid, salts termed glycyrrhizin), 18-alpha-glycyrrhetic acid, glycyrrhetic acid methyl ester, glabric acid, glabrolide, uralenic acid; flavonoids: aglycones including liquiritigenin, isoliquiritigenin (its chalcone), isolicoflavonol, isoliquiritin, licoricidin;

isoflavonoids: aglycones formononetin, glabren, glabridin, glabrol, 3-hydroxyglabrol, glycyrrhisoflavone; cumestan derivatives: glycyrol, isoglycyrol, liquocoumarin; hydroxycoumarins: including herniarin, umbelliferone, glycy coumarin, licopyranocoumarin; steroids: sterols, including beta-sitosterol, stigmasterol; volatile oil (very little): with anethole, estragole, eugenol, hexanoic acid.

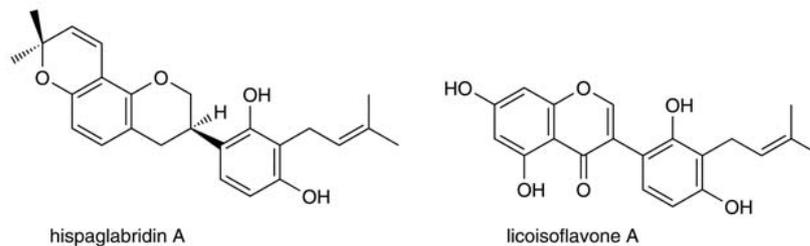
Triterpenoids



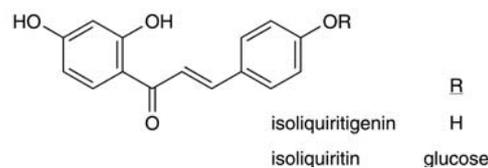
Flavonoids



Isoflavonoids



Chalcones



Selected constituents of liquorice.

Uses. Anti-Inflammatory effect: Glabridin exerts anti-inflammatory effects through inhibition of tyrosinase activity, superoxide anion production, and cyclooxygenase activity. The anti-inflammatory effects of glycyrrhizin is attributed to its anti-thrombin action through inhibition

of thrombin induced platelet aggregation. **Antiulcer effects:** Licorice has protective effects against gastric ulcers induced by aspirin. Licorice has the ability to release endogenous secretin, which is a potential mediator of the antiulcer actions. **Antiviral/Antifungal effects:** Glycyrrhizin suppresses the secretion of hepatitis B virus (HBV) surface antigen (HbsAg) in patients with HBV. Glycyrrhizin stimulates interferon gamma produced by T-cells for an antiviral effect against influenza virus infection. Antiviral action of glycyrrhizin on the human immunodeficiency virus (HIV) occurs by inhibiting replication through interference with virus-cell binding and also suppression of giant cell formation. This improves resistance to *Candida albicans* associated with thermal injury. **Mineralcorticoid effects:** Licorice inhibits the enzyme 11-beta- hydroxysteroid dehydrogenase in the kidney, which leads to decreased transformation of cortisol into cortisone. The mineralocorticoid action of Cortisol causes a decrease in serum potassium and an increase in serum sodium concentration resulting in retention of water, causing weight increase and hypertension. Glycyrrhetic acid, the hydrolytic metabolite of glycyrrhizic acid causes the inhibition of peripheral metabolism of cortisol and produces a pseudo-aldosteronelike effect.

Pharmacopoeial and Other Monographs: BHC 1992, BHP 1996, BP 2009, Complete German Commission E, Martindale 35th edition, Ph. Eur. 6.4, USP 32, WHO volume 1 1999.



HORSE CHESTNUT SEEDS – *HIPPOCASTANI SEMINA*

HORSE CHESTNUT LEAF – *FOLIA HIPPOCASTANI*

Horse chestnut – *Aesculus hippocastanum* L., Fam. Hippocastanaceae.

Plant. The seasonal tree is up to 35 m high; it includes a large regular crown and widely spread roots. The trunk is initially smooth but later has thinly scaled, peeling and fissured bark. The young twigs are yellowish to red-brown and are initially covered with brown hairs. The buds gradually thicken near the distal end and are extremely sticky with dark red bud scales to protect the seed plant bud. The leaves are long, 5 to 7 palmate, with a 20 cm long grooved petiole. The leaflets are initially red-haired, 20 cm long, cuneate-obovate, acute and dentate. The leaflets are rich green above and beneath are light green. The white flowers are in stiffly upright panicles gradually thickening near the distal end. Most of the flowers are male, but a few are female or androgynous. The calyx is fused and bell-shaped with 5 irregular tips. The petals are 10 to 15 mm long with a yellow spot, which turns red. There are 3 upward petals and 2 downward, which are folded at the edge. The flower is

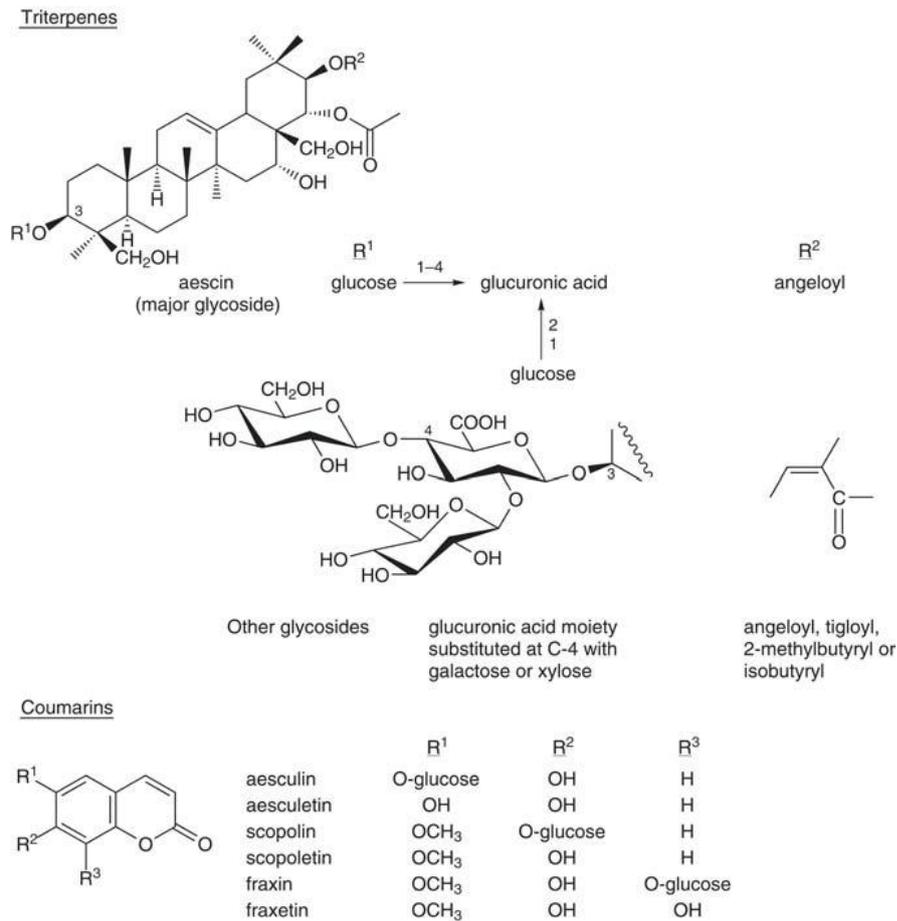
ciliate and cordate (heart shaped) at the base and contains 7 S-shaped, bending stamens with red anthers that are longer than the petals. The ovary is 3-valved, superior and velvety. The fruit capsules are green and globular with soft spines and fine hairs. There are 1 to 3 red-brown seeds (Chestnuts) within the capsules, which are shiny brown with a yellowish gray-brown navel and a tough shell.

Area of distribution. Although the herb is indigenous to the mountains of Greece, Bulgaria, the Caucasus, northern Iran and the Himalayas, it is cultivated elsewhere, especially in northern Europe including the British Isles, Denmark, Scandinavia, Russia and Ukraine.

Description. The rather stiff leaf fragments, some of which show the crenate-serrate margin, have a dark greenish brown upper surface and a lighter lower surface. The 5-7 leaflets of the digitate leaves are nerved, with clearly paralld lateral nerves. Fragments of the grooved petioles are also present.

Globulous or ovoid, 2-4 cm in diameter. The 2 large cotyledons, oily and starchy, often connate with a line of suture more or less visible; covered by a shiny dark-brown tegument with a large whitish spot corresponding to the hilum; tegument creamy white in the immature seed, takes on a brown tinge during maturation, becoming dark brown when mature. Curved radical occupies a depression either on the commissure of the cotyledons or the dorsal side of the cotyledons. Odour slight; taste bitter, acrid.

Constituents. Compounds of horse chestnut leaf: triterpene saponins, hydroxycoumarins: chief component is aesculin, in addition fraxin and scopolin; flavonoids: including rutin, quercitrin, and isoquercitrin; tannins.



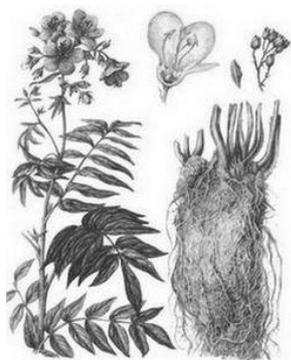
Selected constituents of horse-chestnut.

Compounds of horse chestnut seeds: triterpene saponins 3-5%; the triterpene saponine mixture known as aescin (also escin) consists of diacylated tetra- and pentahydroxy- β -amyrin compounds (Fig.11.3); flavonoids: in particular biosides and triosides of the quercetins; oligosaccharides: including kestose, stachyose; polysaccharides: starch 50%; oligomeric proanthocyanidins, condensed tannins (only in the seed-coat); fatty oil 2-3%.

Uses. Effects of horse chestnut leaf: the main active principles of the anti-exudative effect and improvement of venous tone are hydroxycoumarins (aesculin and fraxin), triterpene saponins in the petioles and leaf, flavonoids and a rich supply of tannins. As found in different animal tests and preclinical investigations, the principal ingredient of Horse Chestnut seed extract, triterpene glycoside mixture (aescin), has an anti-exudative, vascular tightening effect, and reduction of vascular permeability which result in an antiedemic effect. The vein-toning properties of the Horse Chestnut extract also demonstrated improvement of venous return flow. Treatment of symptoms found in pathological conditions of the veins of the legs (chronic venous insufficiency), for example pain and a sensation of heaviness in the legs, nocturnal cramps in the calves, pruritis and swelling of the legs. Venostasin, Retardkapseln, Noricaven, Rexilufen, Aescusan, Hoevenol, etc.

Homeopathic Uses. Homeopathic treatments include hemorrhoids, lumbar and low back pain, venous back pressure.

Pharmacopoeial and Other Monographs: BHP 1996, ESCOP 2003, Martindale 35th edition, USP 32.



JACOB'S LADDER RHIZOME AND ROOT – *POLEMONII RHIZOMATA CUM RADICIBUS*

Jacob's Ladder - *Polemonium coeruleum* L., Fam. Polemoniaceae.

Synonym(s). Charity, English Greek Valerian

Plant. The plant is a perennial. The plant is bright green and smooth. The upper section is covered in short glandular hairs. The rhizome is short and creeping, and the stem is 45 to 90 cm high, hollow and quadrangular. The leaves with numerous pairs of leaflets are 1.25 to 2.5 cm long. These are pinnate and alternate. The numerous flowers grow in clusters at the end of the lateral branches. They are open, slightly hanging and have 5 sepals and 5 petals. The corolla is 2 to 2.5 cm, deep blue and has a short pollen tube. The stamens are enclosed in the tube and have yellow anthers.

Area of distribution. The plant is indigenous to central and northern Europe.

Constituents. Triterpene saponins, flavonoids.

Uses. All parts of the plant contain saponin, which has astringent, diaphoretic and hemolytic effects.



ENGLISH IVY LEAVES - *HEDERAE HELICIS FOLIA*

English Ivy - *Hedera helix* L., Fam. Araliaceae.

Synonym(s). Gum Ivy, True Ivy, Woodbind.

Plant. The plant is an evergreen perennial, which creeps or, by means of adventitious roots, climbs to a length of 3 to 15 m. The stem is branched, the leaves are alternate, petioled, glabrous, glossy, coriaceous. Younger leaves are 5-lobed; the leaves of older flowering plants are ovate-rhomboid. The inflorescences are greenish-yellow umbels, which form dense, semi-globular clusters. The calyx tips are short, almost triangular, tomentose and drooping. The 5 petals are oblong and slightly involute. There are 5 stamens and 1 inferior ovary with 5 valves. The style is fused into a column. The fruit is a globose, usually 5-valved berry, which becomes black and ripens in spring. It contains 3 to 5 reniform, triangular, acute seeds, which are reddish-violet when young, later dark brown, and finally black.

Area of distribution. English Ivy is indigenous to the temperate regions of Europe, and also north and central Asia. It is cultivated in the U.S.

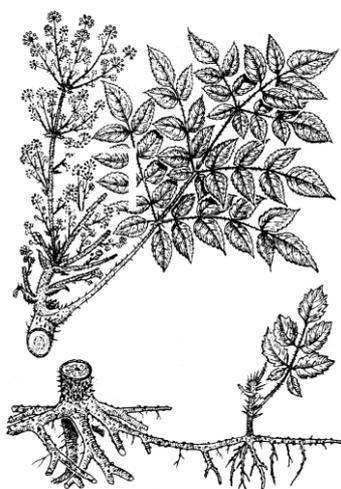
Description. The 3-5-lobed leaves, with more or less triangular lobes, collected between spring and early summer from the non-flowering shoots in the lower reaches of the evergreen woody plant are the part used as a drug. The 4-10 cm long and equally wide, dark green, shiny leaves are cordate at the base: they are firm and leathery, with a white, fan-like nervature which is easily recognized in the cut drug on the lower surface. Young leaves are pubescent, older ones glabrous. Occasionally, the ovate-rhombic to lanceolate leaves with a long acumen and an margin, which are found on the flowering shoots from the upper part of the plant, are collected along with the rest: the dark green petiole is mostly round and longitudinally grooved. The odour is faint, characteristic and somewhat musty. The taste is bland, mucilaginous, somewhat bitter and slightly irritating.

Constituents. Triterpene saponins: aglycone hederagenin, oleanolic acid, bayogenin, chief components hederosaponin C (hederacoside C, slightly transforming into alpha-hederin, aglycone hederagenin), additionally hederosaponin B (hederacoside B); volatile oils: including some with methylethylketone, methylisobutylketone; polyynes: including falcarinol, 11,12-didehydrofalcarinol; steroids: sterols, including β -sitosterol, campesterol; flavonoids: including rutin.

Uses. English Ivy is a respiratory catarrh used for the symptomatic treatment of chronic inflammatory bronchial conditions. Dry extracts of Ivy Leaf are used in monopreparations and also in combination products. Prospan, Sinuc, combination product Bronchipret.

Homeopathic Uses: English Ivy is administered in homeopathy for rachitic states.

Pharmacopoeial and Other Monographs: Ph. Eur. 6.4, BP 2009.



SPIKENARD ROOT – *ARALIAE RACEMOSAE RADICES*

Spikenard - *Aralia racemosa* L., Fam. Araliaceae.

Synonyms. Indian Root, Life of Man, Old Man's Root, Petty Morell, Spignet.

Plant. *Aralia racemosa* is a herbaceous, bushy, stiffly branched perennial with a woody base. The stem extends up to 2 m high and is glabrous and grooved. The leaflets are thin and oval. The leaflets can grow up to 20 cm long and 16 cm wide, but are usually much smaller and cordate at the base. The rhizome is up to 15 cm long and has a diameter of roughly 2,5 cm with prominent concave scars. The roots are about 2 cm thick at the base, pale brown, and wrinkled. The root fracture is short and whitish. The inflorescence is

a large panicle, each branch of which carries a simple, round, 10 to 15 flower umbel. The flowers are small and have greenish-white petals. The drupes are dark red to crimson, roundish and 5-ribbed. The seeds are compressed and have a similarly formed endosperm. The medicinal parts are the fresh and dried rhizome and roots. The root and rhizome of *Aralia racemosa* are gathered from the wild in summer and autumn and chopped while fresh. The freshly chopped roots and rhizomes are either dried or processed immediately to form a thick paste.

Area of distribution. The plant grows in North America from central Canada southward to Virginia.

Constituents. Polyynes: including faltarinole, faltarindiol; triterpene saponins; volatile oil (not much).

Uses. Due to its saponin content, the drug's effectiveness as a reflex expectorant for colds seems plausible. It is also diaphoretic and stimulates tissue renewal. Its efficacy has not been proven.

Homeopathic Uses: Spikenard is used for colds, hay fever and asthma.



JAVA TEA LEAF - ORTHOSIPHONIS FOLIA

Java Tea - *Orthosiphon spicatus*, Fam. Lamiaceae.

Plant. The plant is a 40 to 80 cm high herb. The stem is quadrangular and glabrous to pubescent with crossed, opposite leaves. The leaves are about 75 mm long, usually short-petioled, ovate-lanceolate with an irregularly coarse, roughly serrate to dentate (or occasionally crenate) margin. The upper surface is brownish-green, the lower surface gray-green with strong, protruding ribs and glandular punctate markings. The

plant resembles Peppermint. The flowers usually are arranged in a whorl of 6 (occasionally 10) blooms. The calyx tube is short with an upright-curved upper lip. The corolla is blue to light violet. The corolla tube is about 2 cm long with a broad upper lip that has 3 indentations. The lower lip is narrowing and ovate-lanceolate. The 4 stamens are blue and 2.5 to 3 cm long. The style is as long as the stamen, and the ovary has a disk. The fruit breaks up into 4 oval-oblong nutlets with bumpy surfaces.

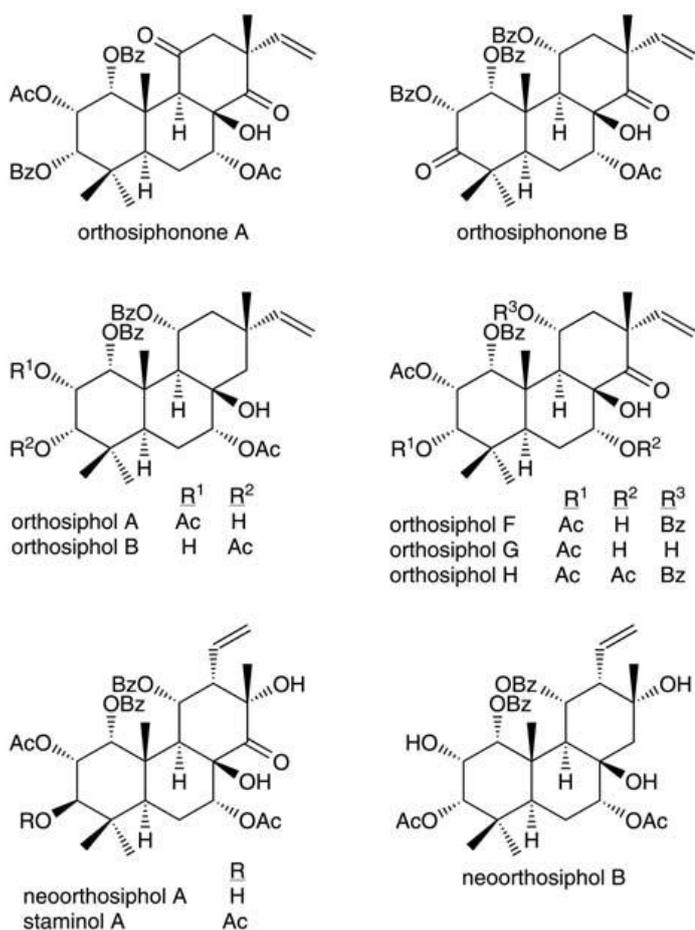
Area of distribution. The plant is found in an area extending from tropical Asia to tropical Australia and is cultivated in those areas and elsewhere.

Description. The medicinal parts are the leaves and stem tips collected during the flowering season consist of the dried leaves and tips. The short-petioled, lanceolate-ovate, 2-7 cm long leaves are cuniate at the base and have a long acumen at the tip; the venation is pinnate and the margin is coarsely serrate. The upper surface is deep green or yellowish green and the lower

surface pale grayish green; the venation on the lower surface sometimes has a violet tinge. The petioles are more or less 4-angled and, like the venation, brownish violet. Very faintly aromatic. Somewhat salty, slightly bitter and astringent.

Constituents. Benzochromenes: orthochromene A, methylripariochromene A and acetovanillochromene. Diterpenes: numerous closely related pimarane-type diterpenes, including orthosiphonones A and B, orthosiphols A, B, E to I, M, N, P, R, S, T, staminol A neo-orthosiphols A and B neo-orthosiphone A; essential oil: 0.02–0.7%. Various compounds: including belemene, β -caryophyllene, α -humulene, palmitic acid. Flavonoids: sinensetin, tetramethylscutellarein, eupatorin, salvigenin, trimethylapigenin, Phenylpropanoids: rosmarinic acid (major), caffeoyl tartrate, dicaffeoyltartrate, four caffeic acid depsides.

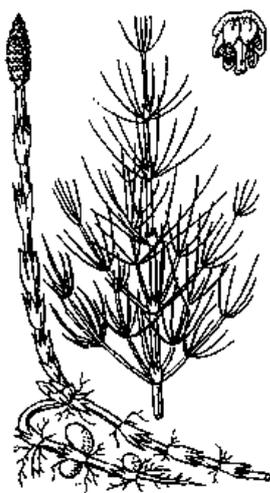
Diterpenes



Selected constituents of Java Tea.

Uses. Java Tea has been shown in human and animal tests to be a mild diuretic. The essential oil of the drug, which contains sesquiterpenes, is antimicrobial, antiphlogistic and possibly antitumoral. It is used for infections of the urinary tract, kidney and bladder stones.

Pharmacopoeial and Other Monographs: BHP 1996, BP 2009, Complete German Commission E, Ph. Eur. 6.4.



HORSETAIL FIELD SHOOTS – *EQUISETI ARVENSIS HERBA*

Horsetail field – *Equisetum arvense* L., Fam. Equisetaceae.

Synonyms. Bottle-Brush, Corn Horsetail, Dutch Rushes, Field Horsetail, Horse Willow, Horsetail Grass, Horsetail Rush, Paddock-Pipes, Pewterwort, Scouring Rush, Shave Grass.

Plant. Horsetail appears in two forms during the year. From March to April the red-brown to straw yellow simple stem develops with leaves arranged in a number of levels on the stem in whorls. The leaves are brown, fused to a sheath at the lower level with black-tipped, dry sporangia cones at the tip sprinkling greenish spore powder. In May

and June there is a sterile summer form with 10 to 14 cm high stems and numerous branches that are arranged in whorls at the nodes. The stem and branches are deeply grooved, usually square and rough.

Area of distribution. Horsetail grows throughout Europe. It grows in Asia as far south as Turkey and Iran. The plant is also found in the Himalayas, central and north China and Japan.

Description. The drug consists of the dried, sterile, green stems of field horsetail. Each node on the main stems and lateral branches has a membranaceous leaf sheaths with triangular-lanceolata, often brown, teeth, the number of which corresponds which the number of ridges of the stem or branch concerned: the first internode of each lateral branch is longer than the leaf sheath of the main stem from which it comes. Both of main stem and lateral branches are green to grayish green, tough and brittle. Tasteless, grates on being chewed between the teeth.

Constituents. Flavonoids: 0.6 to 0-9%: apigenin-5-O-glucoside, genkwanin-5-O-glucoside, kaempferol-3,7-di-O-glucoside, kaempferol-3-O-(6'-O-malonyl-glucoside)-7-O-glucoside, kaempferol-3-O-sophoroside, luteolin-5-O-glucoside, quercetin-3-O-glucoside; Caffeic acid ester up to 1%: including chlorogenic acid, dicoffeoyl-meso-tartaric acid; Silicic acid 5 to 7.7%: to some extent water-soluble; Pyridine alkaloids: nicotine (traces), palustrine (in the gamatophytes and in the rhizome styrolpyrone glucosides, including equisetumpyrone), saponins.

Uses. Horsetail has a mild diuretic and spasmolytic action in animal tests. The flavonoids and silicic acid contribute to the astringent effect. It is used for infections of the urinary tract, kidney and bladder stones, wounds and burns.

Pharmacopoeial and Other Monographs: BHP 1990, Ph. Eur. 6.4, BP 2009, SPU, WHO monographs on medicinal plants commonly used in the Newly Independent States (2010).



SOAPWORT ROOT – *SAPONARIAE RADICES*

Soapwort - *Saponaria officinalis* L., Fam. Caryophyllaceae.

Synonym(s). Soapwood, Soap Root, Latherwort, Bouncing Bet, Fuller's Herb, Bruisewort, Crow Soap.

Plant. The perennial plant is leafy and grows about 100 cm high. The stems are round, erect, and finely downy. The leaves are crossed opposite, oblong to lanceolate, acute, entire-margined, 3-veined and taper to a short petiole. The flowers generally are flesh-colored, sometimes white, row in racemes and have a 5-tipped fused calyx. The petals have long stems. The ovary is superior and has 1 style. The fruit is a capsule with 4 teeth at the tip and

bursts open when ripe. The seeds are reniform-globular and black-brown.

Area of distribution. The plant is indigenous to the temperate regions of North America, Asia, and Europe.

Description. Soapwort root consists of the dried roots, rhizomes and runners of *Saponaria officinalis*. The roots are plowed up in autumn, after the herb has been mown. The root is cleaned and then dried artificially at 50° C. It occurs in cylindrical, long, hard, thin pieces. The outer surface is red-brown in color, the fracture is yellowish. The odour is absent, the taste is slightly burning, irritating remaining for a long time

Constituents. Triterpene saponins up 2 to 8%: aglycones quillaic acid, gypsogenic acid.

Uses. In addition to uses as an expectorant for cough and other diseases of the respiratory tract, folk medicine internal uses also encompass constipation, gastrointestinal disorders, liver and kidney disorders, rheumatic gout, neurasthenia. External folk medicine indications include skin rashes, eczema and as a gargle for tonsillitis.



GOTU KOLA LEAF - *CENTELLA ASIATICA FOLIA*

Gotu Kola - *Centella asiatica* (L.) Urb., Fam. Apiaceae.

Synonym(s). Indian Pennywort, Marsh Penny, Indian Hydrocotyle, White Rot, Thick-leaved Pennywort, Hydrocotyle.

Plant. *Centella asiatica* is a tender umbel plant, which has numerous creeping stems. The stems have roots at the nodes, which are smooth. The circular-reniform leaves are 2 to 6 cm long and 1,5 to 5 wide, with a crenate margin and 5 to 9 ribs. The petioles are 3 to 30 cm long. The pedicles are 1,2 to 4 cm long. The sepals of the epicalyx are oval to circular, with a membranous border. They are about 2,5 to 3 mm long and 1,5 to 2,5 mm wide. The umbels have 2 or 3 sessile or short-pedicled florets. The petals are white, to purple or

pink. The calyx is not generally dentate. The fruit is oval to globular in shape, and has a diameter of 2 to 5 mm. The mericarps are clearly flattened at the sides and usually have 7 to 9 ribs and are raised rugose.

Area of distribution. The plant is indigenous to southeast Asia, India, Sri Lanka, parts of China, the western South Sea Islands, Madagascar, South Africa, southeast U.S., Mexico, Venezuela, Columbia, and eastern South America.

Constituents. Triterpene acids: including asiatic acid, madecassic acid (6-hydroxy asiatic acid), terminolic acid; triterpene acid ester from oligosaccharides (pseudosaponins) including asiaticoside, asiaticoside A, asiaticoside B; volatile oil 0.1%.

Uses. The plant is used internally for rheumatism and skin diseases. Externally, the drug is used for poorly healing wounds, leprosy sores, and post-operative scarring. In Asia, the drug is used to enhance urination, for physical and mental exhaustion, diarrhea, eye diseases, inflammations, asthma, and high blood pressure.

Homeopathic Uses: Gotu Kola is used for skin diseases associated with itching and swelling and inflammation of the uterus.

Pharmacopoeial and Other Monographs: BHP 1983, Martindale 35th edition, WHO volume 1 1999, Ph. Eur. 6.4, BP 2009.



BLACK COHOSH RHIZOME AND ROOT - *CIMICIFUGAE RACEMOSAE RHIZOMATA ET RADICES*

Black cohosh - *Cimicifuga racemosa* L., Nutt., Fam.

Ranunculaceae.

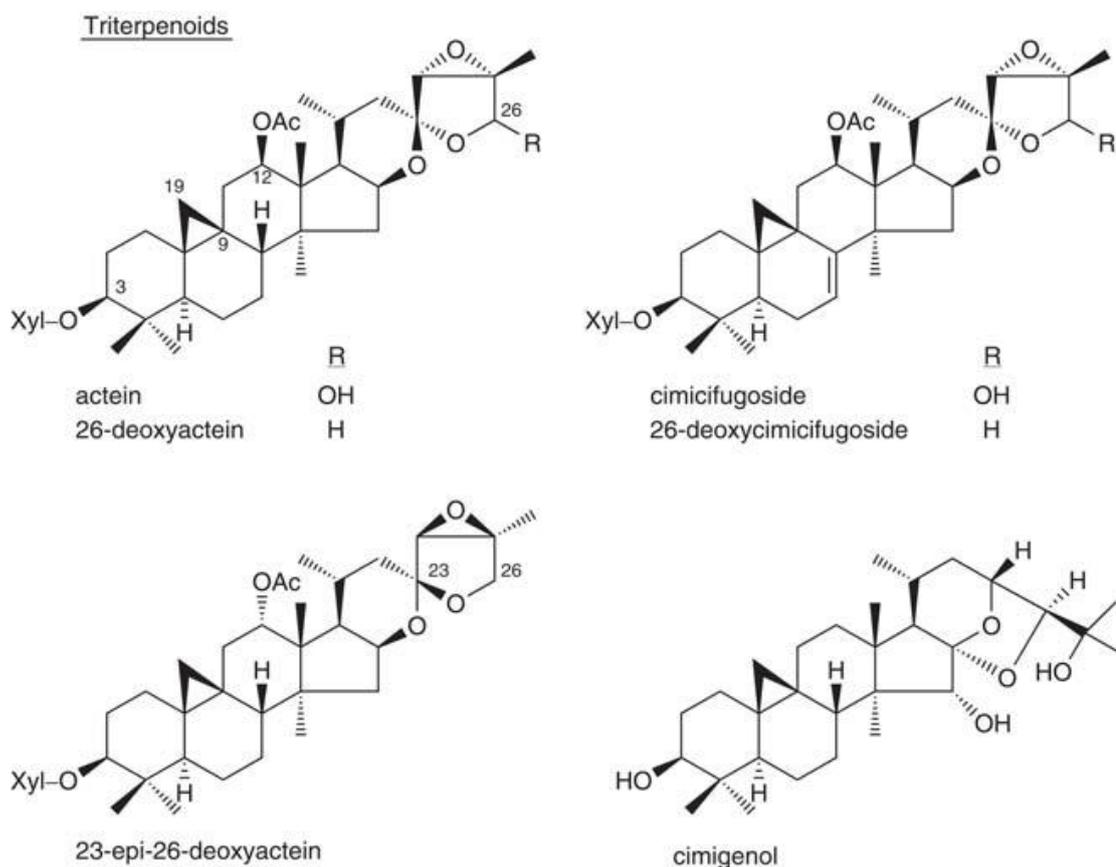
Synonym(s): Black Snakeroot, Cimicifuga, Macrotys Actaea.

Plant. The plant grows 1 to 1.5 m high. It is leafy, with a sturdy, blackish rhizome, which is cylindrical, tough and knotty. The straight, strong, dark brownish roots sprout from the underground rhizome and are roughly quadrangular and grooved. The transverse root section shows wedge-shaped bundles of white wood. The rhizome section shows a large black medulla surrounded by a ring of paler, woodier wedges. The leaves are double-pinnate, smooth and crenate-serrate. The inflorescence is a long-peduncled, drooping raceme, 30 to 90 cm long with white flowers. There are 3 to 8 petals without nectaries, and the sepals enclose the flower bud.

Area of distribution. Black Cohosh is native to Canada and the U.S.; it is cultivated in Europe.

Constituents. Alkaloids: quinolizidine-type, including cytisine, N-methylcytisine and other unidentified compounds; flavonoids: formononetin; phenylpropanoids: phenylpropanoid esters

cimiracemates A-D, isoferulic and ferulic acids, methylcaffeate; terpenoids: complex mixture of 9,19-cycloartenol-type triterpene glycosides with either xylose or arabinose. The isolated compounds include actein and related compounds cimicifugoside (cimigloside); other constituents: acetic acid, butyric acid, formic, palmitic and salicylic acids, hydroxycinnamic acid esters of fukiic and piscidic acids (e.g. fukinolic acid, cimicifugic acids A, B, E, F) glyceryl-L-palmitate.



Selected constituents of black cohosh.

Uses. The active ingredients in the root are the triterpene glycosides such as cimifugaside, 27-deoxyactein and the actein. The increase in luteinizing hormone (LH) that occurs as estrogen levels decrease is implicated as the cause of menopausal symptoms. Compounds of the rootstock of *Cimicifuga racemosa* bind to the estrogen receptor where it selectively suppresses LH secretion with no effect on FSH. The result is an estrogenic effect, which will decrease climacteric symptoms such as hot flashes, diaphoresis and psychological disturbances. There have been conflicting reports stating *Cimicifuga racemosa* has no estrogen-like action. The herb did not appear to have an effect on levels of LH, FSH, sex hormone-binding globulin (SHBG), prolactin and estradiol in a study that concluded the therapeutic effects seen are not attributable to estrogenic or other endocrine-system effects. The improvement in premenstrual symptoms, dysmenorrheal and menopause may be due to the relaxing of uterine tissue.

Approved by Commission E. Climacteric complaints, premenstrual syndrome (PMS).

Pharmacopoeial and Other Monographs: AHP 2002, BHC 1992, BHP 1996, BHMA 2003, BPC 1934, Complete German Commission E, ESCOP 2003, Martindale 35th edition, WHO volume 1 (1999), Legal Category (Licensed Products).



SENECA SNAKEROOT ROOT – *SENEGAE RADICES*

Seneca Snakeroot – *Polygala senega* L., Fam. Polygalaceae.

Synonyms. Milkwort, Mountain Flax, Rattlesnake Root, Seneca.

Plant. The plant is a perennial herb with up to 40 cm high stems, which sprout in the axils of the scalelike bracts of the previous year's growth. The leaves are 8 cm long and 3 cm wide, alternate, ovate-lanceolate to lanceolate, acuminate and denticulate. The upper surface is rich green; the under surface somewhat paler. The root varies in color from pale yellowish-gray to brownish-gray. It is usually twisted or almost spiral and has a thick, irregular, gnarled crown. The raceme is 8 cm long and is smaller than the bracts. The petals are pale red, the wings are yellowish-white with green veins. Seneca Snakeroot consists of the dried root with remains of aerial stems of *Polygala senega* and/or other closely related species or a mixture of *Polygala* species.

Area of distribution. *Polygala senega* is indigenous to the central and western U.S.

Constituents. Triterpene saponins 6-12%: chief components senegins, chief aglycone presenegin; oligosaccharide esters: senegosene; xanthone derivatives (Fig.11.6.); methyl salicylate (traces) and its glucoside.

Saponins

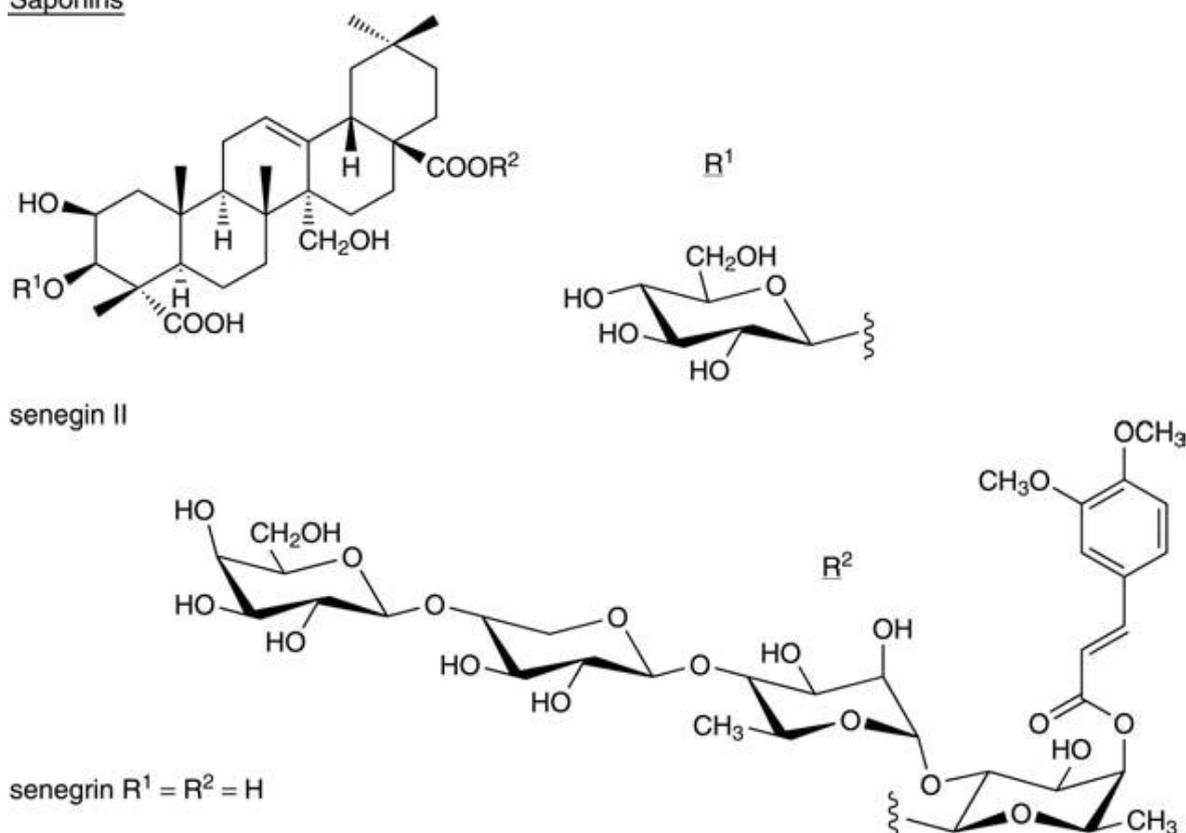


Figure 11.6. Selected constituents of Senega.

Uses. The rhizome is secretolytic and works as an expectorant. The drug is used for congestion of the respiratory tract, as an expectorant in cases of bronchitis with minor sputum output and tracheitis. **Overdosage:** leads to nausea, diarrhea, gastric complaints and queasiness.

Approved by Commission E. Cough/bronchitis.

Pharmacopoeial and Other Monographs: BHC 1992, BHP 1996, BP 2009, Complete German Commission E, ESCOP 2003, Martindale 35th edition. Ph Eur 6.4.

Steroid Saponins



WILD YAM RHIZOME WITH ROOT – *DIOSCOREAE RHIZOMATA ET RADICES*

Wild Yam - *Dioscorea villosa* – Fam. Dioscoreaceae.

Synonym(s). China Root, Colic Root. Devil's Bones, Rheumatism Root, Yuma.

Plant. *Dioscorea villosa* is a perennial vine. It has a pale brown, cylindrical, twisted, tuberous rhizome and a thin, woolly, reddish-brown stem that measures up to 12 m long. The leaves are broadly ovate, usually alternating, cordate and 6 to 14 cm long. The upper surface of the leaves is glabrous and they are pubescent beneath. The fracture is short and

hard. The plant has small greenish-yellow flowers. The male flowers are in drooping panicles; the female ones in drooping spicate racemes.

Area of distribution. The plant is indigenous to the Southern U.S. and Canada. It is now widely cultivated in many parts of the world in tropical, subtropical and temperate regions.

Description. The raw material of yam is represented by pieces of rhizomes are cylindrical, slightly curved, unbranched, longitudinally wrinkled. They are covered by thin layer of cork, which usually easily breaks off. The upper surface of rhizomes bears leaf-scars. Thin unbranched adventitious roots stem from rhizomes; they are up to 40 cm long and about 1 mm in diameter. The outer surface of rhizome is light-brown or yellowish. The fracture is even, white. The odour is weak, specific. The taste is bitter, slightly burning.

Constituents. Saponins: including dioscin (aglycone diosgenin); isoquimiclidine alkaloids: including dioscorin; pyridinal alkaloids: including dioscorine.

Uses. Wild Yam has an antispasmodic, and a mild diaphoretic effect. The root of the plant is used as a precursor for manufacturing progesterone and estrogen. Though the diosgenin component has been promoted as a "natural progesterone," diosgenin does not have any progesterone-like effects. The body does not convert diosgenin into estrogen or any other steroid. Wild Yam is used for rheumatic conditions, gallbladder colic, dysmenorrhea and cramps.



FENUGREEK SEED – *FOENI-GRAECI SEMINA*

Fenugreek - *Trigonella foenum-graecum* L., Fam. Fabaceae.

Synonym(s). Greek Hay Seed, Bird's Foot

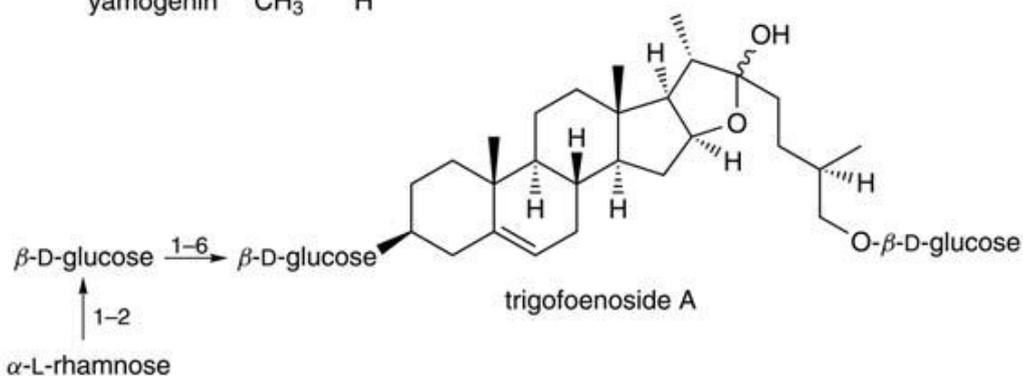
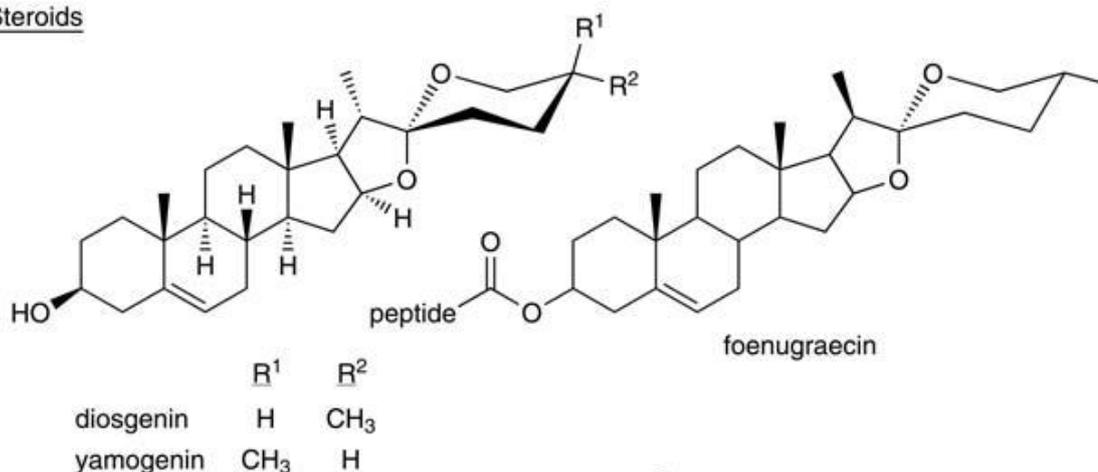
Plant. The plant is an annual, 10 to 50 cm high herb with a long vertical taproot. The stem is sturdy, round, erect or decumbent and branched. The leaves are trifoliate and the petioles are 0.5 to 2 cm long. The leaflets are 1 to 3 cm long, obovate to oblong-lanceolate, obtusely deltoid to rounded. The stipules are fairly large, membranous, ovate, acute and more or less softly pubescent. The 0.8 to 1.8 cm long flowers are solitary or in pairs in the leaf axils. They are almost sessile. The calyx tube is membranous and usually longer than the lanceolate tips. The corolla is usually pale yellow, occasionally darker or violet and about double the length of the calyx. The wings are about half as long as the standard and the carina is very obtuse, round and barely longer than the calyx. The fruit is a 2.5 to 10 cm long and 0.5 to 1 cm wide, erect, leaning, linear and appressed pubescent pod with a long lip. The 4 to 20 seeds are flattened, divided into 2 uneven halves by a deep groove, ovate to dishaped, yellow-brown, or brown-red and very hard when dry.

Area of distribution. The species is common all over the Mediterranean region as far as India and China and southward as far as Ethiopia. The main regions of cultivation are southern France, Turkey, northern Africa, India and China.

Description. The seed is hard, flattened, brown to reddish-brown and more or less rhomboidal with rounded edges. It is 3 mm to 5 mm long, 2 mm to 3 mm wide and 1,5 mm to 2 mm thick. The widest surfaces are marked by a groove that divides the seed into two unequal parts. The smaller part contains the radical; the larger part contains the cotyledons. Fenugreek has a strong characteristic aromatic odour.

Constituents. Steroid saponins 1.2-1.5%: including trigofenosides A to G (to some extent bitter), aglycones including diosgenin, yamogenin, gitogenin, smilagenin, tigogenin, yuccagenin; steroid saponin-peptide ester: including foenugraecin; sterols: chief constituents 24xi-ethyl-cholest-5-en-3beta-ole (65%), sterols that are to some extent esterified; flavonoids: including isoorientin, isovitexin, orientin, orientin arabinoside, isoorientin arabinoside, saponaretin, vicenin-1, vincenin-2, vitexin; trigonelline (caffearin, N-methylbetaine of the nicotinic acid) 0.4%; volatile oil 0.01%: aroma bearer 3-hydroxy-4,5-dimethyl-2(5H)-furanone; mucilages 25-45% (mannogalactans); proteins 25-30%; proteinase inhibitors.

Steroids



Amino acids



Selected constituents of fenugreek.

Uses. Externally, the drug acts as an emollient. Internally, Fenugreek reduces blood sugar, but the mode of action is unclear. It is used for loss of appetite, inflammation of the skin.

Pharmacopoeial and Other Monographs: BHP 1996, BP 2007, Complete German Commission E, Martindale 35th edition, Ph. Eur 6.4.



SARSAPARILLA ROOT – *SARSAPARILLAE RADICES*

Smilax – *Smilax chine* L.

Smilax officinale – *Smilax officinalis* H.B.K., Fam. Liliaceae.

Plant. The species are evergreen shrubs or semishrubs with climbing branches and stipular tendrils. They have a short, gnarled, perennial, creeping or ascending rhizome with numerous long roots stretching over many meters. The branched, thorny,

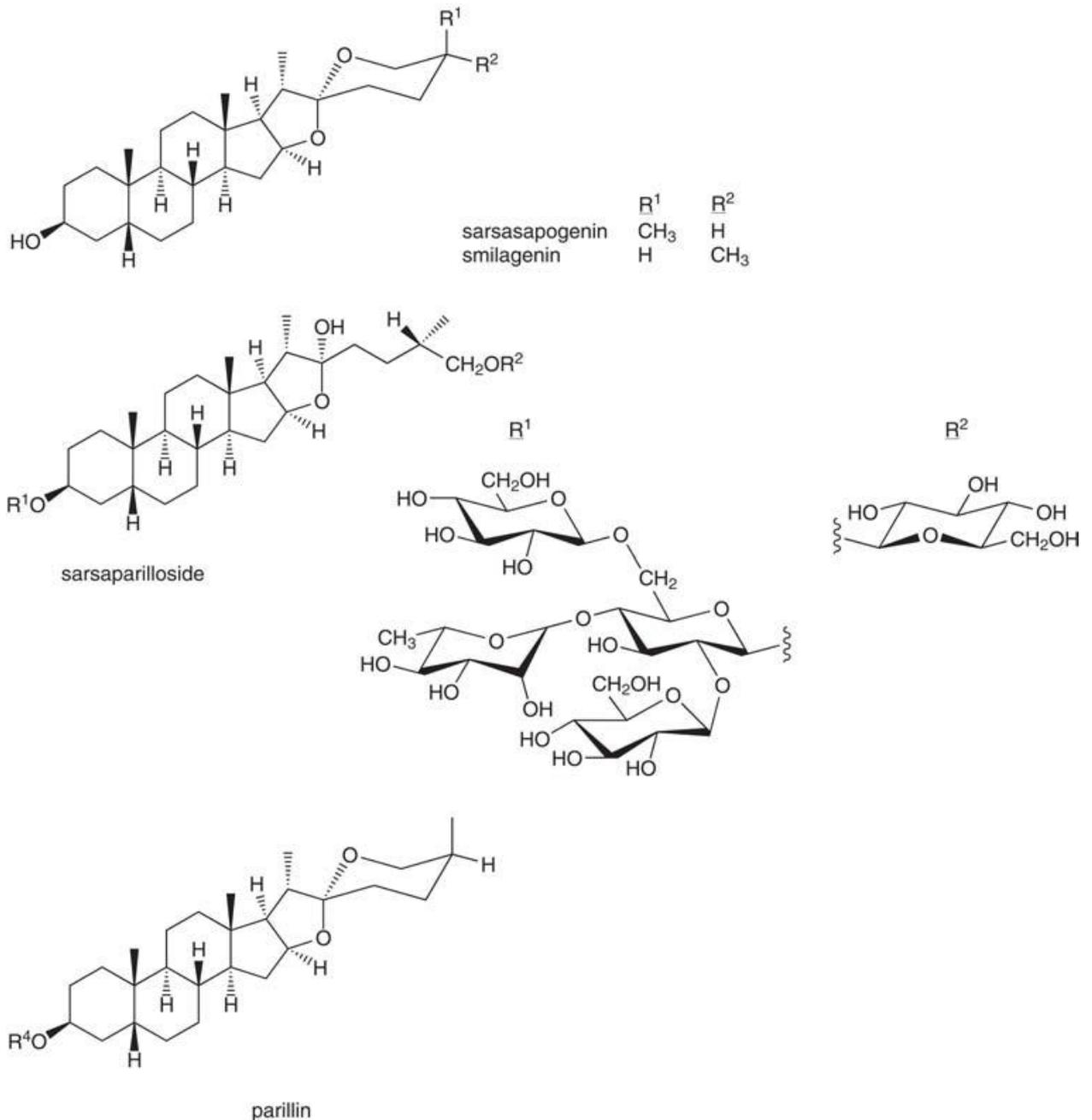
nodular stem has the thickness of an arm and is yellowish-green. The leaves are in 2 rows. They are alternate, simple and often hardy, with 3, occasionally 5, reticulately joined main ribs. The leaf sheaths are ovate and cordate, sagittate and petiolate, or often stipule like. They turn into climbing tendrils above and break off at this point when they die. The flowers are white or pale green, yellow or brown. They are dioecious, usually in axillary cymes or racemes, and contain 6 petals in 2 circles. The ovate to lanceolate tepals are curved outward. The male flowers have 6 stamens with thick filaments and anthers, which are fused at the base of the petals. The female flowers have 6, sometimes only 3, staminoids. The ovate ovary has 3 carpels, each with 1 to 2 atropic ovules and with an almost sessile, bent-back, 3-lobed stigma. The fruit is a globular, red, blue or black berry with 1 to 6 seeds.

Area of distribution. The species is indigenous to tropical and subtropical regions of America, eastern Asia and India. In Europe, only the variety *S. aspera* is found in the Mediterranean region.

Description. Mexican Sarsaparilla. In long roots up to 6 mm, in diameter, frequently attached to a tough, woody crown possessing one or more stem bases; externally light grayish-brown or weak reddish-brown to yellowish-brown, longitudinally ridged and broadly furrowed, the furrows sometimes containing blackish earth; with relatively few fibrous rootlets; fracture of cortex brittle, central cylinder tough and fibrous; the cut or fractured surface exhibiting. It mealy and pale orange, or light yellowish brown and horny cortex, a yellow band porous woody zone and a lighter colored central pith.

Constituents. Steroid saponins 0.5-3%: chief components are sarsaparilloside, along with parillin, as a breakdown product; also including among others desglucoparillin, desglucorhamnoparillin, aglycones sarsapogenin; other constituents: caffeoylshikimic acid, ferulic acid, shikimic acid, kaempferol, quercetin, phytosterols (e.g. β -sitosterol, stigmasterol, pollinastanol); resin; starch; volatile oil.

Triterpenes



Selected constituents of sarsaparilla

Uses. The steroid saponins in the drug are responsible for its irritating effect on the skin and the strong diuretic and diaphoretic effect in high doses, as well as its effect as an emulsifier and foam stabilizer. Preparations of Sarsaparilla root are used for skin diseases, psoriasis, rheumatic complaints, kidney diseases, and as a diuretic and diaphoretic.

Homeopathic Uses: In homeopathy Smilax is used for itching skin rashes, rheumatism and inflammation of the urinary organs.

Pharmacopoeial and Other Monographs: BHC 1992, BHP 1996, Martindale 35th edition.



SAW PALMETTO FRUIT - *SABALIS SERRULATAE*
FRUCTUS

Saw Palmetto - *Serenoa repens* (Bartram) J.K. Small, Fam. Arecaceae.

Plant. The plant is a bushy palm with a maximum height of 6 m. The large, yellow-green leaves have up to 20 segments and form a crown. The inconspicuous cream flowers are in short, densely pubescent, paniculately branched inflorescences. The fruit is deep purple to almost black. It is an ovate, 3 cm long, 1-seeded berry.

It has a hard but fragile pericarp that covers a pale brown, spongy pulp. The endocarp is thin and papery. The fruit is slightly wrinkled 1.25 to 2.5 cm long and 1.25 cm in diameter. The hard seed is pale brown, oval or globular, and has a hilum near the base. The whole panicle can weigh up to 4 kg.

Area of distribution. The plant is indigenous to the coastal regions of the southern states of the U.S., from South Carolina to Florida and southern California.

Constituents. Steroids: sterols, including β -sitosterol, β -sitosterol-3-O-glucosides, β -sitosterol-3-O-diglucoside, β -sitosterol-fatty acid esters and their glucosides, for example β -sitosterol-3-O-myristate, β -sitosterol-3-O-(6-O-myristylbeta-glucosides); flavonoids: including isoquercitrin, kaempferol-3-O-glucosides, rhoifolin; water-soluble polysaccharides (galactoarabane with uronic acid); fatty oil.

Uses. The lipophilic extract of the herb inhibits binding of dihydrotestosterone (DHT) to the cytosolic androgenic receptor and α -1-adrenoceptor in the prostate, thus preventing accumulation of the steroid, which may lead to prostate hyperplasia. Antiandrogenic effects of the lipophilic extract also consist of 5- α -reductase and 3- ketosteroid reductase inhibition. These enzymes are responsible for the conversion of testosterone to DHT and for conversion of DHT to an androgen compound, respectively. Anti-estrogenic effects: the herb lowers cytosol and nuclear receptor values for estrogen which result in an anti-estrogen effect since progesterone receptor content is linked to estrogenic activity. Anti-estrogenic agents inhibit stromatic prostate mass growth in patients with benign prostate hypertrophy. There is also some evidence with inhibition of several steps involved in prolactin receptor signal transduction in ovary cells. Anti-Inflammatory Effects: the hexane extracts of the herb have demonstrated antiinflammatory activity. Inhibition of the synthesis of arachidonic acid inflammatory metabolites, through a double blocking of cyclooxygenas and 5-lipoxygenase pathways results in anti-inflammatory properties. The drug also contains anti-spasmodic properties by inhibiting calcium influx and activation of the sodium/calcium ion exchanger. Induction of-protein synthesis plays a role in the antispasmodic

effect with cyclic AMP as a possible mediator. Extracts of the drug may also antagonize the contracting effect of acetylcholine on urinary bladders.

Approved by Commission E: Prostate complaints, irritable bladder.

Saw Palmetto is used for urination problems in benign prostate hyperplasia stages I and II. This medication relieves only the difficulties associated with an enlarged prostate without reducing the enlargement. Prostagutt mono, Prosta Urgenin Uno, Remiprostan, Permixon (same as U.S. product Elusan Prostate). Defined extracts are also found in combination products.

Homeopathic Uses: The herb is used for micturation problems and inflammation of the urinary tract.

Pharmacopoeial and Other Monographs: BHP 1996, BHMA 2003, BP 2009, BPC 1934, Complete German Commission E, ESCOP 2003, Martindale 35th edition, Ph Eur 6.4, USP 32.



ADAM'S NEEDLE LEAF – *YUCCAE FILAMENTOSAE FOLIA*

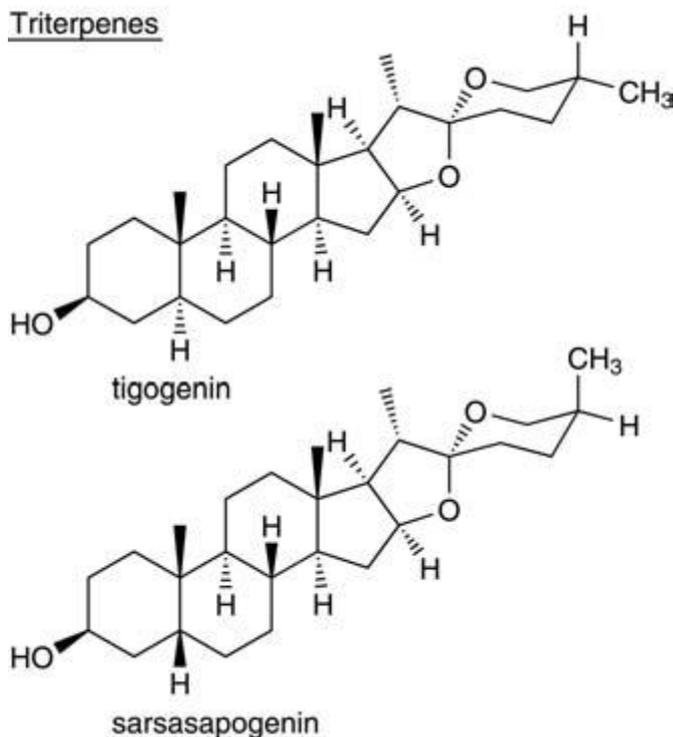
Adam's Needle - *Yucca filamentosa* L., Fam. Agavaceae.

Plant. The plant is 120 to 240 cm in height. The leaves are in a basal rosette. They are sword-shaped and erect with a recurved tip. They are short-thorned, broadly grooved and covered on the margin with long, twisted, whitish or yellowish threads. The flowers are ivory-colored and located in nodding, many-blossomed terminal panicles. The perigone is simple, campanulate, tinged greenish on the outside, with 6 tepals. The flower has 6 stamens, and the stigma is 3-sectioned.

Area of distribution. The plant is indigenous to the southern United States and is cultivated mainly as an ornamental plant in Europe.

Constituents. Steroid saponins: protoyuccoside C, yuccoside B, yuccoside E, yuccoside C, aglycones including sarsapogenin, tigogenin.

Triterpenes



Selected constituents of yucca

Uses. The plant is used for liver and gallbladder disorders.

Pharmacopoeial and Other Monographs: Martindale 35th edition.



BUTCHER'S BROOM HERB – *RUSCI ACULEATI HERBA*

BUTCHER'S BROOM RHIZOME – *RUSCI ACULEATI RHIZOMATA*

Butcher's Broom - *Ruscus aculeatus* L., Fam. Asparagaceae.

Synonym(s). Kneeholm, Pettigree, Sweet Broom, Knee Holly, Jew's Myrtle.

Plant. The plant is a perennial evergreen subshrub that grows 20 to 80 cm high. The stems are erect, woody and heavily branched. The leaves are small, brownmembranous, triangular to lanceolate, and scale-like. The phylloclades (short shoots spread like leaves) are oblong, stiff, double-rowed, up to 2.5 cm long and terminate in a sharp tip. The small greenish white flowers are solitary or in a few clusters and grow from the middle of the leaves. They are dioecious. The corolla is deeply divided into 6 segments. In one variety the stamens are fused at the base. In fertile varieties the style is surrounded by a honey gland. The fertile flowers develop into cherry-sized, scarlet berries, which ripen in September and remain on the tree all winter.

Area of distribution. The plant is indigenous to almost all of Europe, western Asia and North Africa.

Constituents. Steroid saponins 4-6%: chief components, ruscine, ruscoside, aglycones neoruscogenin, ruscogenin; benzofuranes: euparone, ruscodibenzofurane.

Uses. The herb is used as supportive therapy for discomfort of chronic venous insufficiency, such as pain and heaviness, as well as cramps in the legs, itching, and swelling. Butcher's Broom also is used as therapy for hemorrhoid complaints, such as itching and burning.

Pharmacopoeial and Other Monographs: Commission E.