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Research Article

USEFUL PLANT *SAMBUCUS NIGRA* – A REVIEW

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ABSTRACT

Sambucus nigra, commonly called European elder, is a deciduous, somewhat sprawling, multi-stemmed shrub that is native to Europe, SW Asia and N Africa. Elderberries have been a folk remedy for centuries in N. America, Europe, W Asia and N. Africa. *Sambucus nigra* is highly valued in ancient medicine, food, culinary, other uses : cosmetic, dye, insecticide etc. This review article discussed the detail description of *Sambucus nigra* (Elderberry).

Key words: *Sambucus nigra*, Geographic area, Classification, Chromosome, Cytology, Folklore and Muths.

INTRODUCTION

Eldeberry (*Sambucus nigra*) have been a folk remedy for centuries in N. Amrics, Europe, W. Asia and N. Africa, hence the more work done in Ayurveda, Homoeopathy and Allopathy. Due to the benefits of elderberries are being investigated and rediscovered. *S. nigra* is used for its anti-oxidant activity, lower cholestoral, improve vision, boost the immune system, improve heart health and for cough, colds, flu, bacterial and viral infections and tonsilits. Bioflavonoids and the protein juice destroy the ability of cold and flu viruses to infect a cell. Eldeberry juice was used to treat a flu epidemic in Panama in 1995. *S. nigra* is highly valued in medicine, culinary, wildlife value, edibility rating etc, due to this, the present article has been taken for detail



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descriptions i.e. taxonomy, description, history, nutrition value, chemical compositions and its activity, quotes from history, folklore and myths, synonym, hazards, range. Etc.

HISTORY^{1,2}

Dioscorides described two species of Elder : *Sambucus nigra* and *sambucus humilis*. Hippocrates employed *Sambucus* in medicine. Theophrastus is the *Sambucus nigra* of later authors. This plant was well known to the Arabian physicians. It is the **Acte** of Rhazes, and the **Aktha** of Ebn Baithar. According to Dr. Adams, the *sambucus* of Avicenna is not the Elder, but the Jasmine; and the Arabians and Syrians of the present day still use the inner green bark for the same purposes for which it was employed in earlier times. It was employed by Boerhaave and Sydenham as a powerful hydragogue and cathartic in dropsies and still a popular remedy for the same disease. The flowers were formerly used as an infusion for erysipelas, rheumatism, small-pox etc. It was the chief ingredient in Lady Mary Digby's specific; and Elder-flower water and Elder-flower ointment were in every domestic medicine cases; in North America. Indians make an eye-water from the young leaves of the Elder.

The word `Elder` comes from the Anglo-saxon word *aeld*. In Anglo-saxon days, this finds the tree called `Eldrun`, which becomes *Hyltor* and *Hyllantree* in the fourteenth century. One of its names in modern German - *Hollunder* - is clearly derived from the same origin. A member of the honeysuckle family, this small tree has been cultivated since ancient times. Valued in making musical instruments, weaving needles, and of course elderberry wine. There is some confusion among the different species, but the best studied is the European elder, *S. nigra*. Americans used *S. canadensis* for the same medicinal purposes. In countryside where the Elder flourishes it is certainly one of the most attractive features of the hedgerow, while its old-world associations have created for it a place in the hearts of English people.

The name of *sambucus* would come by a musical instrument of the ancients, usually made of this plant.

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Synonyms³ : *Sambucus Raii* syn.

Sambucus acinis albi. Raii Syn

Sambucus laciniatis foliis, Bauh.



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Sambucus, n.

Sambucus nigra Linn.

Sambucus graveolens.

Sambucus peruviana.

Scientific name : *Sambucus nigra*.

Common name : Elderberry-European Elder, Black elderberry, American black elderberry, Blue elderberry, European common elder, Acta, Arn tree, Book tree, Boor tree, Bore tree, Boar tree, Pipa tree.

Genus name : It comes from the Latin name, perhaps connected with *Sambucus* a kind of harb.

Geographical distribution : Great Britain, France and a great part of Europe.

Found : in hedges and wood near villages etc.

CLASSIFICATION⁴

01. Kingdom	Plantae - Plants
02. Sub-kingdom	Tracheobionta – Vascular plants
03. Infra-kingdom	Streptophyta – Land plants
04. Super division	Spermatophyta – Seed plants
05. Division	Magnoliophyte – Flowering plants
06. Sub-division	Spermatophytina – spermatophytes, seed plants, Phancrogames.
07. Class	Magnoliopsida – Dicotyledons
08. Sub-class	Asteridae
09. Order	Dipsacales
10. Family	Caprifoliaceae – Honey suckle family.
11. Genus	<i>Sambucus</i> L. – Eldeberry
12. Species	<i>Sambucus nigra</i> - Black eldeberry.



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Genus : *Sambucus* can be herbaceous, perennial, deciduous shrub or small tree with pinnate leaves and umbels or panicles of small creamy-white flowers followed by red, white or black berries. *Nigra* : bushy large, shrub or small

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tree to 6 m., with pinnate leaves turning pale yellow in autumn, flat sprays of fragrant cream flower is early summer followed by small black berries.

Quotes from history :² (i) The old traditions, say the Elder became the emblem of sorrow and death, and out of the legends which linger round the tree there grew up a host of superstitious fancies which still remain in the minds of simple country folk. (ii) An old custom among gypsies forbade them using the wood to kindle their campfires and gleaners of fire woods for formerly would look carefully through the faggots lest a stick of Elder should have found its way into the bundles, perhaps because the Holy cross was believed to have been fashioned out of a giant elder tree, though probably the superstitious awe of harming the Elder descended from old heathen myths of northern Europe. (iii) In most countries, especially in Denmark, the Elder was intimately connected with magic. In its branches was supposed to dwell and dryad, Hylde-Moer the Elder-tree-mother, who lived in the tree and watched over it should the tree be cut down and furniture be made wood, Hylde-More was believed to follow her property and haunt the owners. (iv) The Russians believe that Elder-tree drive away evil spirits, and the Bohemians go to it with a spell to take away fever. (v) The Sicilians think that sticks of its wood will kill serpents and drive away robbers, and the Serbs introduce a stick of Elder into their weeding ceremonies to bring good luck. (vi) A cross made of Elder and fastened to cowhouse and stables was supposed to keep all evil from the animals. (vii) The use of the Elder for funeral purposes was an old English custom referred to by Spenser. (viii) Green Elder branches were also buried in the grave to protect the dead from witches and evil spirits, and in some parts it was a custom for the driver of the hearse to carry a whip made of Elder wood. (ix) The pith of the branches when cut in round, flat shapes, is dipped in oil, lighted, and then put to float in a glass of water, its light on Christmas Eve is thought to reveal to the owner all the witches and sorcerers in the neighborhood, and again.

Folklore and Myths² : (i) It was thought the Elder could not be hit by lightning, and so should be planted near the house. (ii) In the 16th century it was believed that the leaves of the Elder should be gathered on the last day of April, and hung on doors and windows to prevent witches from entering the house. (iii) A twig of Elder carried close to the body, was thought to give good health and luck. (iv) The dried flowers, berries, leaves and



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roots of Elder are used for protection and to ward off both natural and un-natural illness. (v) For protection from instruction-place a pinch of any form of Elder in the four corners of the room and also in the room's center or, alternatively, hang some Elder in bags above the front and back doors. This is said to provide protection against break-ins and also to shield one from prying eyes, both physical and spiritual. (vi) Some folks sprinkle elder flower, poppy seeds and oregano around a place of illegal business in the belief that poppy seeds confuse the cops, oregano keeps them away, and no law officer will walk or drive over Elder.

DESCRIPTION^{1,5-6}

Native range : Europe, northern Africa, southern Asia. **Height** : 8 – 20 feet. **Spread** : 8-20 feet. **Grows** : 8-20 feet (less frequently to 30 feet) tall. **Habitats** : hedgerows, scrub, woods, roadsides, waste places etc. especially on disturbed base-rich and nitrogen rich soil. **Altitude** : 310 – 460 m. asl. **Rises**: with a woody trunk filled with a white medullary substances or pith and covered externally with a rough, ash-coloured bark. **Branches** : smooth, contain a large quantity of pith. **Leaves** : shining green colour, unpleasant aroma, when cut or crushed, arranged opposite pair, 10-30 cm . long, pinnate with five to seven (rarely nine) leaflets, the leaflets 5-12 cm. long and 3-5 cm. broad, with a pointed serrated margins, smooth and nearly equal to the base. **Flowers** : hermaphrodite, born in large flat corymbs 10 – 25 cm. diameter, numerous, cream coloured and form large beautiful cyme, with five principal branches, in late spring to mid summer the individual flowers ivory white 5-6 mm. diameter, with five petals. **Calyx** : superior, permanent, nearly wheel-shaped, with 5 deep segments. **Cololla** : synpetalous, nearly wheel – shaped, with five deep obtuse, somewhat reflexed segments. **Filament** : fine, awl – shaped, about the length of corolla, and bearing roundish, heart shaped, yellow anthers. **Germe**n : ovate, without a style, but supporting three obtuse stigmas. **Fruit** : glossy dark purple to black berry, 3-5 mm. diameter. **Barries** : spherical of one cell, containing three, sometimes two berries, first a reddish hue, but become of a purplish-black when ripe. **Seeds** : convex on one side, angular on the other. **Phenology** : May – June.

DESCRIPTION OF CHROMOSOME⁷

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Chromosome number (2n) = 36, vary in length from 3.5 – 6.5 μm . There are 4 meta centric, sub-metacentric and 6 acrocentric , 1 telocentric and 2 satellited pairs of which one is sub-metacentric and other acrocentric.



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NUTRITIONAL VALUE per 100 gms⁸

01. **Energy** : 305 KJ (73 K.cal). 02. **Carbohydrates** : 18.4 gm. 03. **Dietary fiber** : 7.0 gm. 04. **Fat** : 0.5 gm. 05. **Protein** : 0.66 gm. 06. **Vitamins** : (i) vitamin A : 4.0 %. (ii) Thiamine (B₁) : 6.0 %, (iii) Riboflavin (B₂) : 5.0 %, (iv) Niacin (B₃): 3.0 %, (v) Pantothenic acid (B₅) : 3.0 %, (vi) Vitamin (B₆) :18 %, (vii) Folate (B₉) : 2.0 %, (viii) Vitamin (c) : 43.0 %, 07. **Mineral** : (i) Calcium : 4.0 %, (ii) Iron : 12.0 %, (iii) Magnesium : 1.0 %, (iv) Phosphorus : 6.0 % (v) Potassium : 6.0 % (vi) Zinc : 1 %. 08 **Water** : 79 – 80 .

CONSTITUENTS⁹⁻²⁰

Bark : α - amyrenone, α - amyrin, betulin, oleanolic acid, β - sitosterol, nigrin b, a lectin similar to ricin, 2 ribosome inactivating proteins that are less toxic to cells and animals. **Flowers/Leaves** : flavonoids including quercetin (3.0 %), rutin, hyperoside, and anthocyanins, essential oils (responsible for the muscat aroma), mucilage, tannins (3.0 %, organic acids, glycoside, plastocyanin and sambunigrin, high amount of N-phenylpropenoyl-L- amino acid amides found in flowers. **Fruit** : protein homologous to type 2 ribosome inactive protein. Bark contains 2 ribosome inactivating protein, consisting of an A chain with N-glycosidase activity and β - chain devoid of carbohydrate binding activity normally present. Lactin isolated from bark tetrametric with two distinct sub-units and rich in glutamine/ glutamic acid, valine and leucine. Quercetin present in elder and shown potent inhibitor of oxidase. Bind heavy metals.

USES^{3,21-29}

Edible use : (1) **raw or cooked** – The flavor of the raw fruit is not acceptable to many tastes, though when cooked it makes delicious Jams, preserves, pies and so forth. (ii) used fresh or dried, dried is less bitter. (iii) It used to add flavor and colour to preserves- jams, pies, sauces, chutneys etc. (iv) often used to make wine. (v) fruit about 8 mm. in diameter and born in large cluster. (2) **Flowers** : raw or cooked – (i) first dried than use- flower crisp and some what juicy, have aromatic small and flavor. (ii) delicious raw as a refreshing snack on summer day, though look out for the insects. (iii) add a muscated flavor to stewed fruit, jellies and jams (especially good berry jam). (iv) make a sparkling wine. (v) Sweet tea made from a dried flowers. (3) **Leaves** : used to impart a green colouring to oils and fats.

Medical uses : Elder has a very long history of household use as an a medicinal herb and also much used by herbalists. The plant has been called ` The medicine chest of country people`. The flowers are the main part used in modern herbalism, though all parts of the plant have been used at times, stimulant. (1) **Inner bark** : collected from young trees in the autumn and sun dried – (i) diuretic, strong purgative and large doses emetic.



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(ii) treatment of constipation and arthritic conditions. (iii) emollient ointment made from green inner bark. (2) **Leaves** : can be used both fresh or dry – (i) purgative, nauseous than bark, diaphoretic, diuretic, expectorant and haemostatic. (ii) Juice-good treatment for inflamed eyes. (iii) ointment- made from the leaves in emollient : bruises, sprains, chilblains, wound etc. (3)**Flowers**: (i) fresh flowers used in distillation of ` Elder Flower Water`, flowers can be preserved with salt to make them available for distillation later in the season-mildly astringent and gentle stimulant : used vehicle for the eye and skin lotion. (ii) dried flowers : diaphoretic, diuretic, expectorant, galactagogue and pectoral. (iii) infusion : chest complaints, bathe inflamed eyes, spring tonic and blood cleanser. (iv) external use : as poultices – easy to pain and abate inflammation. (v) ointment : chilblains, burns, wounds, scalds etc.. (4) **Fruit** : wine making, preserves etc., these retain the medical properties of the fruit, diaphoretic, gently laxative. Tea is good remedy for colic and diarrhea. (5) **Pith of young stem** : burns and scalds. (6) **Root** : no longer used in herbal medicine but it formerly had a high reputation as an emetic and purgative, one drop was very effective.

Compost heap : The plant is a valuable addition to the compost heap; its flowers are an alternative ingredient of `QR` herbal active. **Root** : improve fermentation of the compost heap when growing nearby. **Leaves** :insects repellent, very effective when rubbed on the skin due to own unique fragrance, powdered act as deterrent or made into spray when they act an insecticide, effective various fungal infections such as leaf rot and powdery mildew. Dried flowering shoots : repel insects, rodents etc. **Flowers** : used in skin lotions, oils and ointments. Excellent pioneer species use when re-establish woodland. Dye : obtained from fruit and bark, bark of older branches and root use as an ingredient in dye black, green dye obtains from leaves when alum is used as a mordant. **Berries** : yields of various shades of blue

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and purple dyes, hair dye, turning the hair black. Blue colouring matter from the fruit can be used as a litmus to test of acid and alkali , it turns green for alkaline and red in acid solutions. **Pith** : pushes out easily and the hollow stems thus made pipes for blowing air into a fire, made into musical instruments. Pith of wood used for making microscope, slides and also for treating burns and scalds, mature wood white and fine-grained. It is easily cut and polishes well. Valued highly by carpenters, it has may used for making skewers, mathematical instruments, toys etc.

Culinary uses : (i) The dark blue/purple barriers can be eaten when fully ripe but are mildly poisonous in their unripe state. (ii) all green parts of the plants are poisonous, containing cyanogenic glycosides. The barrier



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are edible after cooking and can be used to make jam, jelly, chutney and pontack sauces. (iii) The flowerheads are commonly used in infusions, giving a very common refreshing drink in Northern Europe and the Balkans. (iv) In Europe, the flowers are made into a syrup or cordial, which is diluted with water before drinking. (v) The popularity of this traditional drink has recently encouraged some commercial soft drink producers to introduce elder flower-flavoured drink. In Scandinavia and Germany, soup made from the elder berry is a traditional meal. (vi) In Hungary, an elderberry brandy is made that requires 50 Kg of fruit to produce 1 Litre of brandy. (viii) In SW Sweden, it is traditional to make a snaps liquor flavoured with elder-flower. (ix) Elder flowers are also used in liquors such as St. Germain, and in a mildly alcoholic sparkling elderflower` Champagne`. (x) In Beerse, Belgium, a variety of jenever called Beers vlierke is made from the berries.

TRADITIONAL MEDICINE^{3, 30-32}

This plant is used as a medicinal plant by native people and herbalists. Stem-bark, leaves, flowers, fruits and root extracts are used in bronchitis, cough, upper respiratory cold infections and fever. Fruits and flowers have been used in traditional Austrian medicine- internally(fruits as tea, jelly, juice or syrup, flowers as tea or syrup) for treatment of disorders of the respiratory tract, wouth, gastro-intestinal tract, skin, viral infection, fever cold and influenza. The dried corollas and stamens have been as a vehicle for eye and skin lotions, while the fruits are to promote urination.

PHYSIOLOGICAL EFFECTS¹

01. **On plant** : plants are affected from the exhalation of the Elder. No plants will grow under the shadow of the tree. 02. **On animals** : The barriers are said to be poisonous to poultry, and the flowers to peafowles. If turnips, cabbages, fruit-trees, or corn (which are subject to blight from a variety of insects) are whipped with the green leaves and branches of Elder, the insects will not attack them. 03. **On man** : The whole plant has an unpleasant narcotic smell and some authors state that its exhalations are so noxious as to render it unsafe to sleep under its shade. (04) **Studies** : as Austria`s university of Graz found that elderberry extract reduces oxidation of low-density lipoprotein (LDL) cholesterol. Oxidation of LDL cholesterol is implicated in atherogenesis, thus contributing to cardiovascular disease.

WILDLIFE VALUE³³⁻³⁵

Elder rates as fair to good forage for animals such as mule deer, elk, sheep and small birds. It is classified as nesting habitat for many birds, including hummingbirds, warblers and vireos. Elder berries are a favorite food for migrating band-tailed pigeons in northern California, which may sometimes strip an entire bush in a short



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time . Elder is cited as a poisonous plant for mammals, and as a weed in certain habitats. All parts of the plant except for the flowers and ripe berries (but including the rape seeds) are poisonous , containing the cyanogenic glycoside sambunigrin. The bark contains calcium oxalate crystals.

DOSES³⁶

The smallest dose is sufficient to produce the requisite effect. Ample infusions therefore can do more, but are injurious in promoting too great an excess of heat and perspiration, and thus weakening the patient and protracting the cure. Adult doses : (i) Sinupret : 2 tablets taken 3 times a day for bacterial sinusitis. (ii) Sambuol : 4 tab: a day for 3 days for cold and flu. (iii) Tea : steep 3-5 gms dried flower in 1 cup boiling water for 10-15 minutes. Strain and drink three times a day.

HIZZARD¹

(i) Plants can spread somewhat aggressively in optimum conditions. (ii) Some susceptibility to canker, powdery mildew, leaf spot, borers, spider mites and aphids. (iii) Branches are susceptible to damage from high winds or from heavy snow/ice in water.

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ANTIDOTES¹

To small doses : Arsenicum. Camphora.

SPECIAL PRECTIONS AND WARNINGS³⁷⁻³⁸

(1) Pregnancy and breast-feeding : There is not enough reliable information about the safety of taking elderflower if you are pregnant or breast-feeding. Stay on the safe side and avoid use. (2) Diabetes : There is a concern that elder flower might lower blood sugar levels. If taken with diabetes medications, it might make sugar levels go too low. If you have diabetes and use elderflower, be sure to monitor your blood sugar levels carefully. Check with your health care provider to see if the dose of diabetes medications you are taking needs to be lower. (3) Surgery : Elderflowers might lower blood sugar levels. There is some concern that it might interfere with blood sugar control during and after surgery. Stop using elderflower at least 2 weeks before a scheduled surgery. (4) If you have an autoimmune disease, such as rheumatoid arthritis or lupus. You should ask your doctors before taking elderberry, as it may stimulate the immune system. (5) do not use unripe or uncooked elderberries. They may be poisonous.



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PROBLEMS

(1) Plant can spread somewhat aggressively in optimum conditions. (2) some susceptibility to canker, powdery mildew, leaf spot, borers, spider mites and aphids. (3) Branches are susceptible to damage from high winds or from heavy snow/ice in water.

FUTURE

Plants for a future can not take any responsibility for any adverse effects from the use of plants. Always seek advice from a professional before using a plant medically.

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REFERENCES

01. Hamilton, E. 1997. Flora Homoeopathica, B. Jain publishers, Pvt. Ltd. New Delhi. 454 – 458.
02. <http://www.indianmirror.com/ayurveda/elderberries.html>.
03. [http:// www.pfaf.org/user/plant.aspx?Latin Name + Sambucus + nigra](http://www.pfaf.org/user/plant.aspx?Latin Name + Sambucus + nigra)
04. www.itis.gov/servlet/singleRpt/single Rpt?search.topic=TSN&search value. 35328.
05. Hackney, P. 1992. Stew art`s and Cony`s Flora of the North-east of Ireland, Institute of Irish studies. The Queen`s University of Belfast. ISBN 0853894469 (HB).
06. Webh, D.A., Parnell, J. and Doogu, D. 1966. Dundalga Press Ltd. Dunkdalk. ISBN. 0.85221-121-7.
07. Mark, D., Atkinson and Atkinson, E. 2002. *Sambucus nigra*, journal of Ecology. 90. 5. 895 – 923.
08. [https:// en.wikipedia.org/wiki/sambucus](https://en.wikipedia.org/wiki/sambucus).
09. Lawire, W., McLean, J. and Paton, A.C. 1964. Triterpenoids in the bark of elder (Sambucus). Phytochemistry. 3. 267-268.



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10. Battelli, M.G., Citores, L., Buonamici, L., Ferreras, J.M., de Benito, F.M., Stripe, F. and Girbes. 1997. Toxicity and cytotoxicity of nigrin b, a two-chain ribosome-inactivating protein from sambucus nigra: comparison with ricin. Arch Toxicol. 71. 6. 360 – 364.
11. Davidek, J. 1961. Isolation of chromatographically pure rutin from flowers of elder. Nature. 189 (4763) 487-488.
12. Toulemonde, B. and Richard, H.M. 1983. Volatile constituents of dry elder (sambucus nigra L.) flowers. J. Agri. Food Chem. 31. 2. 365 – 370.
13. Scawen, M.D., Ramshaw, J.A., Brown, R.H. and Boulter, D. 1974. The amino-acid sequence of plastocyanin from Sambucus nigra L. (Elder). Eur. J. Biochem. 44. 1. 299 – 303.
14. Hensel, T., Deters, A.M., Muller, G., Stark, T., Wittschier, N. and Hofmann, T. 2007. Occurrence of N-Phenylpropenoyl – L – amino acid amides in different herbal drugs and their influence on human keratinocytes. On human liver cells and adhesion of Helicobacter pylori to the human stomach. Plant Med. 73. 2. 142 -150.
15. van Damme, E.J., Roy, S., Barra, A., Rouge, P., van Leuven, F. and Peumans, W.J. 1997. The major elderberry (sambucus nigra) fruit is a lectin derived from a truncated type 2 ribosome-inactivating protein. Plant J. 12. 6. 1251-1260.
16. Broekaert, W.F., Nsimba-Lubaki, M., Pecyers, B. and Peumans, W.J. 1984. A lectin from elder (sambucus nigra L) Bark. Biochem. J. 221. 1. 163 – 169.
17. Coupe, S.A., Taylor, J.E. and Roberts, J.A. 1995. Characterisation of an mRNA encoding a metallothionein-like Protein that accumulates during ethylene-promoted abscission of sambucus nigra L. leaflets. planta. 197.3.442- 447.



Journal of Medicinal Chemistry and Drug Discovery

18. van Damme, C.J., Barre, A., Rouge, P., van Leuven, F. and Peumans, W.J. 1997. Isolation and molecular cloning of a Novel type 2 ribosome-inactivating protein with an inactive B chain from elderberry (*Sambucus nigra*) bark. *J. Biol. Chem.* 272. 13. 8353 – 8360.
19. Peumans, W.J., Roy, S., Barre, A., Rouge, P., van Leuven, F. and van Damme, E.J. 1998. Elderberry (*Sambucus nigra*) contains truncated Neu5Ac (α -2,6) Gal/Gal NAC-binding type 2 ribosome-inactivating proteins. *FEBS Lett.* 425. 1. 35 – 39.
20. Chang, W.S., Lee, Y.J., Lu, F.J. and Chiang, H.C. 1993. Inhibitory effects of flavonoids on xanthine oxidase. *Anticancer Res.* 13. 2165 – 2170.
21. www.wildernesscollege.com/elderberry-plant.html.
22. www.harlequinsgardens.com/mikls-articles;elderberry-shrub-food-and-medicine.
23. www.herbwisdom.com/herb-elderberry.html.
24. Bolli, R. 1994. Revision of genus *Sambucus*. *Dessert Bot.* 223. 1-256.
25. <https://www.hort.produce-educ.edu/new-crop/nenu-07/pafs/charlebois-284-292.pdf>.
26. Gray, A.M., Abdel-wahab Y.H. and Flatt, P.R. 2000. The traditional plant treatment. *Sambucus nigra* (Elder) exhibits insulin-like and insulin-releasing actions in-vitro. *J. Nutr.* 130. 1. 15-20.
27. Kong, F. 2009. Pilot clinical study on proprietary elderberry extract efficacy in addressing influenza symptoms. *Online Journal of Pharmacology and Pharmacokinetics.* 5. 32-43.
28. Professor Julia Morton, University of Miami.
29. Kikbracken, J. 1995. *Easy way guide trees*. Larousse.



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30. Mojave Desert Large shrub and veins` (<http://offroadinghome.ajmed.net/resources/plants2.htm>). Offroadinghome. Ajmed.net. Retrieved 2012-07-16.
31. Vogl, S., Picker, P., Mihaly-Bison, J., Fakhrudin, N., Atanasov, A.G., Hiss, E.H., Wawrosch, C., Reznicek, G., Dirsch, V. M., Sankel, J. and Kopp, B. 2013. `` Ethanopharmacological in vitro studies on Austria`s folk medicine- An Unexp-lore lore in vitro anti-inflammatory activites of 71 Austrian traditional herbal drugs``, J. Ethanopharmacol. 149.3. 750-751. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3791396>)
32. Wiart, C. 2006. Medicinal Plants of the Asia-Pacific : Drug for the future ? World Scientific. ISBN 981-256-341-5.
33. CONSIDERATIONS (<http://www.fs.fed.us/database/feis/plants/shrub/samngic/all.html#MANAGEMENT>)
34. *Sambucus nigra* (<http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?32994>)at Germplasm Resources Information Network.
35. Campa, C., Schmitt-kopplin, P., Cataldi, T.R., Bufo, S.A., Freitag, D. and Kettrup, A. 2000. Analysis of cyanogenic glycosides by micellar capillary electrophoresis, Journal of chromatography B. 739. 95-100. Doi:10.1016/S0378 – 4347 (99) 00375-8.
36. <https://umm.edu/health/medical/altmed/herb/elderberry>.
37. [www.webmd.com/vitamins-supplements/ingredientmono-708-sambucus%20Nigra%\(elderflower\).aspx](http://www.webmd.com/vitamins-supplements/ingredientmono-708-sambucus%20Nigra%(elderflower).aspx)? Active Ingreant.
38. www.sacredearth.com/ethnobotany/plant_profiles/elder.php.