

Elderberry - a very nutritious and medicinal shrub

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For thousands of years hardly any other plant than the elderberry scrub was more appreciated for its high health and nutritious properties. In particular, this affects its flowers and berries. As a traditional home remedy there are a variety of recipes for preparation which also are conducive to health in the same time. Under the aspect of a health conscious diet there is a growing recollection. Therefore the industry has responded to this fact and offers also finished products.

Although the roots, barks and leaves of the black elderberry contain valuable healthy ingredients however they have completely lost importance in our times. Out of all parts of the elderberry plant only the flowers 'sambuci flos' has gained a scientific confirmation. All other parts have to be seen as a common traditional herbal medicine due to their traditional application.



Nevertheless the elderberries - *Sambuci fructus*- are an exception according to case reports that describe its healing properties. Well prepared, fresh and ripe fruits have a higher priority in contrast to dried berries. Moreover, it remains to note that under today's standards, the juice of the ripe fruit as a natural colorant is more and more used by the food industry [1, 2].

In Central Europe also the red elder or grape elderberry (*sambucus racemomsum*) as well as the dwarf elder or attich (*sambucus ebulus*) can be found next to the black elderberry (*sambucus nigra*).

It's obvious that the black elder lifts itself up in appearance against the grape- elderberry. The grape- elderberry carries a greenish yellow flower in upright panicles which also smell strongly with earlier bloom. Its berries are dyed scarlet in contrast to the black elderberries.

Again the dwarf-elder is more similar to the black elderberry, which also develops white, fragrant flowers and black fruits. Both forms of elder remain smaller in plant height than the black elderberry and stand out from feathery leaves. The elderberry is clearly showing up for us in the phenological calendar. It proclaims the summer with the appearance of his numerous creamy white fragrant flowers at the edges of paths and forests. Later, when its branches benches under black purple berries the summer is turning into fall [3, 4].

History as a medicinal plant

The role of the elder as a remedy can be traced back to ancient times. Even Hippocrates (460-370 BC), the most famous physician of antiquity and founder of medicine as a science praised the healing power of the elder. He recommended it against constipation, dropsy and menstrual pain. These are still important applications for the use of the elder. The elder was mentioned in writing also by the Greek philosopher and naturalist Theophrastus of Eresus (377-287 BC). His writings on the basics of plant morphology and physiology made him to the "Father of ancient botany". The Roman Scholar Pliny Secundus the elder one (23-79) describes in his work for Naturopathy "Naturalis historia" the elder as a diuretic. The Greek doctor and most famous pharmacologist of Antiquity, Dioscorides (app. 40-90) recorded in his big pharmacology "De materia medica" the elder with a number of therapeutic indications, such as the use of the roots against dropsy and the use of fresh leaves as a topical treatment of boils [5, 6, 7]. In the middle Ages treat the elder was described in detail in medical documents. The abbess Hildegard of Bingen (1098-1179) also used the elder as a healing remedy. She described the elder as a "pharmacy of the poor" whereas she didn't particularly emphasized it as a medical plant.

The interesting thesis of Albertus Magnus (1193-1280) a Dominican monk and bishop of Regensburg written down in his classic book 'De Vegetabilibus' described the following: "When the bark of the elder is sharpened from top to bottom, it acts as a laxative. When the bark of the branches is sharpened from bottom to the top it acts as an emetic agent" [7, 8].

The botanist, physician and professor of medicine Tabernaemontanus (1522-1590) said about the elderberry that it "eliminates all harmful liquids casts via the sweat". The eminent physician Theophrastus Bombastus von Hohenheim, known as Paracelsus (1493-1541), used the elderberry for the treatment of gout, vertigo and as a laxative. The botanist and physician Hieronymus Bock (1498-1554) reports as follows (freely translated from German):

"Elder used in the body, has a strongly laxative nature, and it eliminates dropsy.

Others create nice vinegar of the elderflowers"

Dr Adamus Lonicerus from Frankfurt (1528-1586) recommended elderberry as a diuretic, antipyretic and blood purifying agent. Dr. Christoph William Hufeland (1762-1836) often prescribed to his patients a steam bath and gargle water made from elderberry for respiratory diseases. [6, 7, 8]

In folk medicine the plant also found its determination in many other disorders, no matter which kind. It was found out that the flowers promote the secretion of the sweat glands while the berries stimulate kidney function.

Thus, the elderberries were used to treat rheumatism, gout and skin diseases as a "blood cleansing" agent. Till today elderflower is used as an agent that can be used in diseases that can be influenced by "sweating-out" such as fever, colds and influenza infections [6].

Myth of the elder

In folklore and mythology the elder is described in the lyrics of several songs as a healing and magical tree. Also the Grimm brothers created a monument for the elder as it plays a role in their fairytale of Frau Holle.

The elder is a very old house tree, even when it is not cultivated or planted; it does not take long until it is eventually there and growing by him selves. It seems as it is searching a close proximity to humans. The elder had an important status in custom where many myths have sprung up around it.

So the elder was honored as a holy tree by Celts and Germans, who embodied the goddess Freia or Holla. She was a Germanic house and fertility goddess, a well-meaning deity to mankind who healed animals and humans. Furthermore the elder tree was believed to be a place where "good house spirits" live that should preserve and protect the house and its occupants from getting harmed.

Therefore, the elder tree should not be cropped or cut down, because by the removal of the elder you robbed the good spirits of their dwelling house. In the unavoidable case of that an elder tree needed to be cut down, he was asked with a saying for forgiveness. The admiration of the elder was expressed by making a curtsy by girls, and men took off their hats to show their respect [4, 5, 9].

Botanical description of the black elderberry

The black elderberry, *Sambucus nigra* L., syn. *S.arborescens* Gilib., *P medullina* Gilib., *S. vulgaris* LAM, belongs to the large family of honeysuckle plants, the Caprifoliaceae. Popular names for it are Alhorn, Back Holder, Betschel, eider tree, Elder, Eller, Ellhorn, lilac, Holder, Holder, Holder bush, elderberry bush, elder, elder, Huskolder, Keilken, Kelkenbusch, kishke or black holder.

Internationally it is named in England as common elder or boure tree, in France it is named seu, sus, grand sureau or "Abre de Judas". The elderberry is one of the most common shrub species in Central Europe. It also can be found in the rest of Europe, in Western Siberia, in northern India, the Caucasus, Asia Minor and North Africa. It is characterized by its robustness and unpretentiousness. Elderberry is extremely resistant against frost and it grows well in partial shade, on weed- and ruderal areas, in woodland clearings or along roadsides.



However, it grows especially on moderate to sandy, nitrogen-rich and fresh, slightly acidic loamy soil. As nitrogen marker you can find it growing especially on extremely nitrogen-rich sites. It is a plant normal growing at sea level, yet it is also found in the Alps up to 1,200 m altitude. The elder likes to grow close to houses. Often it clings downright to houses.

The black elder is a kind of shrub that can be a shallow-rooted forged shrub or a small tree up to 7 m high, growing straight upright and with profuse branching. The branches of this native shrub are often arcuate protruding. The shoots are thick and filled with loose white marks. The thicker branches and the trunks have a lengthwise furrowed, gray-brown, corky bark.



The summer and fresh green leaves are pinnate, unpaired and show a serrated edge. From May to July flat, umbrella formed creamy white single flowers appear on young wood in diameter up to 20 cm wide. The flowers are a quite a visual attraction for our eyes.



The fresh, strong, fruity sweet fragrance is distinctive and typical of the black elderflowers. The flowers are well attended by bees (honey bees) and hoverflies. In the fall the hanging fruit stands with countless spherical, glossy black berries provide a further highlight. They are among the favorite dishes of many birds. While the berries ripen, also the stems on which they grow develop a reddish color [2, 3, 4, 5, 10].

The term 'elder' is limited to the German language area. In the "Old High German" language the bush was called 'Holuntar'. The term is put together of the term "hol" for "hollow" and from the word "tar" for tree which could be an indication for the hollow, marrow-filled branches. Another name for the black elderberry was Holder (holder = crushing wood, describing the fragility of the branches). The name for elder is subject of many attempts of explanation. On one hand it has been associated with "hollow", and on the other hand with the "Goddess Holle", even in conjunction with "holy". The final syllable "der" in the Old High German language is a hint to the word tar = tree.

The scientific name 'Sambucus' is derived from 'Sambuka', a Greek musical instrument similar to the panpipe, which was made of the wood of the elder tree. The dark color of the berries lead to the surname nigra (=black). Another potential explanation could lie in the word "Sambucus" which is the Greek word for trombone. According to this, instruments with the best sound should have been manufactured from elderberry wood. In Italy, a pleasant flute called "Sampogna" is played. [3, 5, 10, 11, 12].

Ingredients within the elder

Elderberry blossoms (Sambuci flos) contain 0.03 to 0.14% essential oil with a high content of free fatty acids (palmitic acid), 0.7-3.5% flavonoids (rutin, hyperoside, isoquercitrin), about 3% hydroxycinnamic acid derivatives (chlorogenic acid, caffeic acid, ferulic acid), about 1% triterpenic alcohols

(α - and β -amyrin palmitate), about 0.85% triterpenic acids (ursolic acid and oleanolic acid), mucilages and with 4-9% abundant potassium salts [1, 2, 13, 14].

Elderberries (*Sambuci fructus*) contain flavonoids (Rutin, hyperoside, isoquercitrin), Anthocyanglykoside (Sambucin, Sambucyanin and chrysanthemine) 0.1% essential oil, cyanogenic glycosides (in the seed: Sambunigrin, Prunasin, Zierin, Holocalin) 7.5% sugar (glucose, fructose), fruit acids (citric acid, malic acid), vitamins (B2, C and folic acid), bitter substances, potassium and phosphorus as well as lectins in the pulp. [1, 2, 5, 14, 15]

Elderberry leaves (*folium sambuci*) contain flavonoids (quercetin, rutoside), triterpene derivatives (ursolic and oleanolic acid, α - and β -Amyrinpalmitat), sterols (campesterol, α -sitosterol, stigmasterol), cyanogenic glycosides (Sambunigrin, prunasin, Zierin, Holocalin) and alkanes (n-hentriacontane, n-nonacosane) and lectins. [2, 5, 14]

Elderberry bark (*sambuci cortex*) contains triterpenes (α -amyrin, α -Amyron, ursolic acid and oleanolic acid, betulin) Cerylalcohol, n-heptacosane, β -sitosterol, tannins and traces of Sambunigrin. The fresh bark also contains lectins [2, 5, 14].

Spectrum of effects of individual elder ingredients

The anthocyanin glycosides are high-quality colorants and also an energy source. They affect vital physiological control mechanisms. They have health promoting effects on the function, control and coordination processes in the brain. Overall they contribute to the general revitalization or regeneration of the endocrine system as well as for an improved cellular respiration and blood purification. These plant pigments support the whole human metabolism. They have a positive effect on the pancreas and the liver. The Sambucyanin that also appears in elder was previously called "Vitamin P".



In conjunction with the anthocyanin glycosides the flavonoids protect cell membranes against changes by "free radicals". They have vessel sealing, antimicrobial, antiviral, anti-inflammatory, diuretic and spasmolytic properties. Flavonoids further contribute to the stabilization of the cardiovascular system. The etheric oil in its flowers has sudorific, expectorant and anti-inflammatory effects. The triterpenes show significant anti-inflammatory effects, that are supported by the tannins [5, 6, 8, 9].

Elderberry as medicine

Only the elder flowers (*Sambuci flos*) are scientifically accepted as a drug. All other applications referring to the usage of berries, leaves and bark, have purely national naturopathic references.

From the wide range of elder flower effects the Commission E monograph only accepted the „sudorific effect" and "a stimulating effect on bronchial secretate excretion".

This indication can also be found in the monograph ESCOP for elder flower (*Sambuci flos*) and the WHO monograph for *Flos Sambuci* (elderberry flowers) [16].

However, studies on the sudorific properties are not known. It is assumed, however, that the sudorific effect, results from the stimulating effects on the circulation caused by the flavonoids. Colds and the treatment of feverish colds are the indicated treatment areas for elderberries that are mostly served as tea. Elderflower tea is also used to boost the immune system, because it mobilizes the non-specific body defense. Due to the diuretic and blood purifying effect, elderflower tea is also used for diseases such as: rheumatism and skin blemishes. However, the effect is medically not proven yet. The detoxifying properties of elderflower also support weight loss.

For an aqueous extract an inhibition of the expression of pro inflammatory mediators via NF-KB was detected. In recent years a higher concentration of N-phenyl-L-aminoacidamides were discovered in the elderflower, which inhibit the adhesion of *Helicobacter pylori* to the gastric mucosa. The well-known elderflower tea can also be used as a gargle or mouthwash as a treatment for other diseases of the respiratory system such as coughs, colds, laryngitis and flu. However, its modern applications as well as its traditional uses are all based largely on in-depth knowledge and experience [2, 5, 6, 14, 18].

In addition to the elderflowers the elderberries (*Sambuci fructus*) have broad health benefits that are, however, not yet officially accepted. From a scientific perspective, the berries still have a high phytotherapeutic value and a public appreciation on the basis of field reports.

The berries contain much higher amounts of vitamins and minerals than the blossoms. Elderberry juice made from mature fresh fruits is also known as lilac berry juice and is used for its very versatile and specifically high medicinal and nutritional value. Its active ingredients can contribute in many ways to the improvement of the general physical condition and can positively influence various diseases. Therefore these liquid preparations are an effective tonic. Their high content of vitamin C and "Vitamin J" (anti-pneumonia factor) play a major role in the treatment of colds. The dried herb or the juice of the ripe fruit are taken against constipation to stimulate the excretion of urine and as a sudorific in colds. The fresh berries should have a laxative effect, while the dried fruit can be used in diarrhea.

The fruit acids, tannins and anthocyanins in the elder berries can be regarded as gentle laxative ingredients. The flavonoid glycosides in the berries act as diuretic and sudorific agents, similar as in the elder flowers.

Noteworthy are also the antioxidant effects of the anthocyanins with a pronounced antiviral potency among others against influenza, herpes simplex and HIV viruses. Proven is also a bacteriostatic effect on *Helicobacter pylori*. The shells of the berries of the black elderberry contain up to 60% of the purple dye sambucyanin. This flavonoid is one of the phytochemicals that acts as a free radical scavenger and as that it is supposed to reduce the risk for cardiovascular diseases and cancer.

Traditionally, the preparations of elderberry are used to treat colds and coughs with promising effects. The boiled juice is well tolerated. Fresh juice is commonly used to stimulate the excretion of urine. For the relief of neuralgic complaints, rheumatism and sciatica taking the juice or sauce is recommended accordingly because of its high vitamin content. [1, 2, 5, 6, 7, 8, 9]

In folk medicine elderberry leaves, *foliums Sambuci* are given for internal excitation of perspiration and urine flow and for constipation.

Ingredient	Anti-inflammatory	Anti-oxidative	Anti-bacterial	Anti-viral	Astringent
Anthocyanes (Sambucin, Sambucyanine)	+	+			
Flavonoids (Rutin, Hyperosid)	+	+	+	+	
Tannins (Chlorogenic acid)	+	+	+	+	+
Triterpenes (Betulin, Ursolic-, Oleanolic acid, α -, β -Amyrin)	+		+	+	

Table 1: activity profile of individual ingredients [8, 16, 17]

The leaves have a stronger laxative effect compared to the fresh berries. However, these are mildly toxic, so the use of the leaves is not recommended. Typically they have been used in the form of compresses for headaches, ulcers, burns, wounds and inflammation. For these indications, and others, however, there is no scientific evidence. The leaves should also have a healing effect on the skin. As part of prepared ointments, it can be used against contusions, sprains and skin wounds. Moreover, using them as a poultice is described.



Increased and improved urine output should be achieved by the administration as a tea. This could lead to an increased excretion of toxic metabolites that would relieve also other organs. Referring to the ingredient rutin a potential effect on stabilization and a strengthening the resilience of capillaries could be postulated [2, 7, 8]

Elderberry bark (Sambuci cortex) in the form of tea or decoctions relieves from bloating, intestinal cramps, chronic stomach discomfort or persistent constipation. Based on the tannins and triterpenes in this part of the plant it can be derived at the same time to a general astringent and anti-inflammatory as well as anti-bacterial and anti-viral effect. Under these aspects decoctions of bark were also used for gargle or externally for skin inflammation, wound care or nail ulcers and burns.

Component properties

Flowers	diaphoretic, antipyretic, expectorant, anti-inflammatory, immunostimulatory antiviral, antibacterial
Berries	immune strengthening, anti-neuralgic, antiviral, antibacterial, antioxidant, laxative, diuretic
Leaves	diuretic, blood purifier, laxative, detoxifiers
Bark	diuretic, laxative, anti-inflammatory

Table 2 healing properties of the individual components [2, 7, 16, 19]

In the preparation as a tea or decoction it also can be used for its diuretic properties to influence dropsy and kidney disorders, to increase the elimination of toxic substances. In this way they are quite useful in assessment of rheumatism and gout, to purify the blood, joints or tissue if necessary. Normally, the body regulates this by itself. The liver is indirectly relieved as has to detoxify a lower amount of metabolites due to an increased urinary elimination of endogenous and foreign waste products. Traditional applications are also reported its use in rheumatic diseases and lying-in women to stimulate milk flow. [2, 8]

Healthy eating with elder

In the domestic application, the inflorescences of the elder and its ripened fruits play both an important role in the human diet and for human health. Especially the hot drunken juice of the fruits protects against colds. The pulp made from processed fruits is a popular home remedy that acts as a mild laxative. As a precaution, drink tea of elder flowers in the cold season creates a feeling of well-being and prevents the same time diseases of the respiratory tract.

Depending on the season, the elder flowers are freshly picked and processed immediately or dried for later use or variously conserved. Well-known forms of preparation are the flowers in the home-fried elderflower, which are in the German language called as "Hollerküchel", Elderberry Pancakes, elderberry fritters or "Hollerschöberl". For this the umbrella panicles-are dipped in a thin batter of flour, eggs and other ingredients, such as wine or beer batter and then are fried in a pan or deep fried. In addition, the flowers are used as flavoring for beverages. Especially prevalent are elderberry lemonade and elderberry syrup. The flowers are placed in a sugar solution and after a few days they are filtered off. During this time the sugar solution has accumulated the elderflower flavor. Even the addition of the flowers to a tasty wine was and is a delicacy and the elderflower flavor increases in the wine during storing. A particular specialty is still the elderberry champagne that is further treated after the open fermentation at the beginning in lemon sour sugar solution then stored in "bow bottles" where it develops to "sparkling wine". From tradition this is a good thirst-quenching drink for hay harvest.

Elderberries are usually processes to jelly, jam, juice, syrup or wine of fresh harvest at home or even in industrial processes. However, attention should be given to all the green plant parts of the harvested materials such as the umbel stalks and seeds of the berries, because all this contains vomiting causing ingredient sambunigrin. Thus, it also causes discomfort to sensitive individuals when the berries of the elder are eaten raw. By heating the berries during processing, this cyanogenic glycoside is known to be detoxified.

In northern Germany an elderberry soup is cooked from the berries. The berries are used for baking or will be used as an ingredient in red fruit jelly. Also, in northern Germany, the thickened juice from the fruit is usually also put into "Grog" (Grog: combination of hot water, mixed with rum). The berries can be frozen easily. The juice is very aromatic, but low in acidity and barely sweet. Therefore, it is often mixed with apple juice or other sweet fruit juices. Also described is the preparation of a (wild) fruit brandy from the elderberries. Important to know is that only the fully mature and black berries should be used, and before the mashing process the cones have to be removed [6, 7, 8, 22, 23, 24, 25].

Elderberry as a natural dye

The intense blue-violet color of the juice from elderberries was formerly used for dyeing hair, textiles and leather. It was also used in the medieval book painting. The juice also colored red wine. White wine was flavored with sweet fruity flower syrup. [4, 6, 11, 22]

Both, consumers and the food industry- have higher expectations and requirements concerning the properties colorants and dyes, anthocyanins from elderberry increasingly gain more importance as a natural dye today. It is used for sweets, dairy products and even in the food industry. It also gains more and more importance in the textile industry [1, 2, 22].

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