Aloe barbadensis
– a legendary medicinal plant

Fig. 1. Aloe barbadensis Miller. Plantation in southern California. Photo: © H B Juneby.

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Summary

*Aloe barbadensis* (*Aloe vera*) is native to the Mediterranean region of southern Europe and North Africa and to the Canary Islands. It is commonly grown in Asia, southern Europe, southern USA, Mexico, Aruba, Bonaire, Bermuda, the Bahamas, West Indies, Central and South America.

The medicinal use of aloe was already mentioned more than 4000 years ago in a collection of Sumerian clay tablets dated 2100 BC. Aloe was also mentioned as a laxative in the Egyptian Papyrus Ebers from 1552 BC. Aloe has had a very long historical use as a strong laxative treatment for chronic constipation, and it is still listed as a laxative in many pharmacopoeias. However, it has now been largely superseded by less toxic laxatives.

Today there are hundreds of different medicinal, cosmetic and food products on the market that contain various amounts of non-laxative aloe juice/gel. The aloe content has become an important marketing factor which capitalizes on the legendary fame of this medicinal plant. However, there are many aloe products of a questionable quality on the market, which has led to the foundation of a product quality certification program, administered by the International Aloe Science Council.

Externally, fresh aloe gel from the inner central part (parenchyma) of the leaf often has a very good effect in acne, pimples, eczema and other skin problems, poorly healing wounds, leg ulcers, burns due to excessive heat, sun exposure and in the treatment of radiation dermatitis. Internally, aloe juice can be used in gastro-enteritis and peptic ulcers. The dried latex, with high barbaloin content, is a strong laxative.

The best way to benefit from the healing properties of *Aloe vera* is probably to keep a potted plant in the house and use the gel from a fresh leaf whenever it is needed to treat minor burns and other conditions where it may have some medicinal value. This will also eliminate the need to worry about the quality and medicinal value of some commercial product.
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1 Introduction

The medicinal use of aloe was already mentioned more than 4000 years ago in a collection of Sumerian clay tablets dated 2100 BC (Kramer, 1954). Aloe was also mentioned as a laxative in the Egyptian Papyrus Ebers from 1552 BC (Taylor, 1965). Aloe has had a very long historical use as a strong laxative treatment for chronic constipation, and it is still listed as a laxative in the following pharmacopoeias: Austrian, British, Brazilian, Egyptian, European, French, German, Greek, Hungarian, Italian, Japanese, Netherlands, Nordic, Portuguese, Romanian, Swiss, Turkish and U.S. However, it has now been largely superseded by less toxic laxatives (Reynolds, 1993).

According to a famous legend, Alexander the Great sent a commission to the Island of Socotra in the year 333 BC to investigate the local aloe production. The report was favorable, which prompted Aristotele, in 325 BC, to urge his protégé Alexander the Great to conquer the Island of Socotra in the Arabian Sea, to make medicinal aloe available for healing the battle wounds of his troops (El Zawahry et al., 1973; Lindeberg et al., 1982).

The historically documented medical use of aloe was as a laxative. According to Danhof (1987, p. 93), ”the supposed use of fresh internal gel of the leaves for battle wounds of Alexander's men is wholly unsupported, but does make a fine story!”

According to another legend, Queen Nefertiti of the 14th century BC in Egypt used the internal aloe gel as a beauty aid. Danhof (1987, p. 82) remarks that, ”it does make a good story for a lady whose likeness is well known today, and who is highly regarded as the epitome of feminine beauty. Certainly, the ill-smelling dried yellow latex or sap would have no appeal as an aid in accentuating beauty.” The legend also claims that famous Queen Cleopatra of the 1st century BC also used aloe gel as a beauty aid.

Today there are hundreds of different medicinal, cosmetic and food products on the market that contain various amounts of juice/gel from Aloe barbadensis. The aloe content has become an important marketing factor which capitalizes on the legendary fame of this medicinal plant. However, there are many aloe products of a questionable quality on the market, which in the early 1980's led to the foundation of a product quality certification program, administered by the International Aloe Science Council (IASC). In March 2009 the IASC had certified about 500 finished aloe products and raw materials from more than 80 companies worldwide, but there are hundreds of other aloe products on the market which are not certified (IASC 2009).
2 Monograph on *Aloe barbadensis*

Fig. 2. A newly harvested aloe leaf from a plantation in southern California. Photo: © H B Juneby.

2.1 Name


2.2 Habitat

Native to the Mediterranean region of southern Europe and North Africa and to the Canary Islands. Commonly grown in Asia, southern Europe, southern USA, Mexico, Aruba, Bonaire, Bermuda, the Bahamas, West Indies, Central and South America (Morton, 1977).

2.3 Parts used

The largest leaves, which grow closest to the ground, are harvested by cutting with the point of a knife at the constricted base, close to the stem. This avoids undue leakage of latex and allows the leaf to self-seal and remain in good condition for two or three weeks without refrigeration (Morton, 1977).
An aloe plant may mature in one year with ideal climate, exposure to sunlight, water supply, soil nutrients, etc. Harvesting may begin the second year, with a leaf reaching maturity every one to three months. With less ideal conditions, full maturity may not be reached until the plant is three or four years old. An aloe plant usually produces optimally for five or six years, but may continue to produce at least twice as long. In commercial aloe plantations, three leaves of about one kilogram (two pounds) each in weight and 50 – 75 cm (20 – 30 inches) in length are harvested three or four times a year (Danhof, 1987).

![Fig. 3. The inner mucous leaf parenchyma. Photo: © H B Juneby.](image)

*Aloe succus* (Aloe juice/gel) – Fresh stabilized viscous juice/gel from the inner central part (parenchyma) of the leaf. It is best removed by hand to avoid admixture of aloin from the pericycle cells located just under the leaf epidermis. *Aloe* – dried (inspissated) latex from the superficial pericycle cells with a high aloin content. The cut leaves are stacked face down with the base inward around the perimeter of a pit lined with an animal hide or a canvas. The latex seeps out continuously from the leaves for about six hours and it is later concentrated by boiling or drying in the sun (Morton, 1977; Wagner, 1993).
2.4 Active ingredients

Fresh aloe juice/gel from the inner leaf parenchyma contains 96% water, polysaccharides (mucilage) consisting mainly of D-glucose and D-mannose, tannins, steroids, enzymes, plant hormones, amino acids, vitamins, minerals, and a small amount of barbaloin. The dried latex from the superficial pericycle cells contains at least 28% hydroxyanthracene, calculated as anhydrous barbaloin, which is a mixture of aloin A and aloin B, resin and saponins (Bradley, 1992; Steinegger & Hänsel, 1988; Wagner, 1993; Sandberg & Bohlin, 1993; Samuelsson, 2004).

2.5 Pharmacology

Barbaloin resembles the anthraquinone glycosides in Senna and have a strongly irritating effect on the intestine, increasing peristalsis and having a strong laxative effect (Reynolds, 1993; Wagner, 1993). A local application is effective against itching (Fantus, 1922). There are no published studies on the pharmacokinetics and metabolism of barb-aloin. Juice/gel from the inner leaf parenchyma contains very small amounts of barbaloin and only has a very mild laxative effect (Steinegger & Hänsel, 1988).

The mucilage (gelatinous polysaccharides) mainly has a local effect on the skin and mucous membranes at direct contact, because they can form a barrier that protects against mechanical and chemical irritation. This property is very useful in the treatment of poorly healing wounds, burns, gastro-enteritis and peptic ulcers. The application of aloe gel on burns quickly relieves pain, reduces the severity of the burn, accelerates healing and prevents scar formation (Danhof, 1987).

According to a recent study, “Simultaneous application of Aloe vera gel and microcurrent is an excellent choice for the treatment of open wounds thus indicating a synergistic action of these two applications.” (Mendonça et al., 2009).

Fresh aloe gel has an anti-inflammatory effect (inhibits the synthesis of prostaglandin) which may be due to a combination of the substances magnesium silicate, bradykinase and the glucoprotein aloctin A (Wagner, 1993). A combination of aloe gel and cortisone enhances the anti-inflammatory effect of the hormone on the skin (Davis et al., 1991). A recent study indicates that aloin and aloe-emodin may be a key constituent responsible for the anti-inflammatory effect of aloe (Park et al., 2009). Skin damage from radiation treatments has successfully been treated with aloe gel (McLaughlin, 1936; Morton, 1961; Goyal & Gehlot, 2009).

Fresh aloe juice has a very interesting property. It enhances the growth of human cells in cell cultures and speeds the healing of damaged tissue. On the other hand, the aloe gel contained in cosmetic products has been shown to have a negative effect on the healing process (Winters et al., 1981).
Another study used tissue cultures with human fibroblasts, to which was added various concentrations (0.01 – 0.3%) of yellow aloe rich latex from the aloe leaf’s superficial pericycle cells compared to the addition of aloe gel from the inner leaf parenchyma. It turned out that all concentrations of aloe latex killed all the cells in the culture while aloe gel stimulated cell growth by up to 882% at the highest (0.3%) gel concentration (Danhof & Mc Analley 1983; Danhof, 1984).

Aloe and other plants that contain anthraquinones have an antiseptic effect against a number of bacteria and fungi, e.g. staphylococci, streptococci, salmonella bacteria and Candida albicans fungi (Steinegger & Hänsel, 1988; Duke, 1997). It has even been suggested that administration of Aloe vera could be a potential therapeutic agent for the clinical treatment of sepsis, which is an acute life-threatening condition, which remains the major cause of death in intensive care units (Yun et al., 2009). Another study suggests that Aloe vera “could inhibit infectious diseases by stimulating the host defense mechanism, especially the phagocytic and killing activities of macrophages.” (Tamura et al., 2009).

The enzymes in aloe are destroyed at temperatures above 70° C. Fresh leaves and carefully made extracts therefore have the greatest effect, while heated, powdered dry extracts have much weaker, or even negative effects (Winters et al., 1981; Schmidt & Greenspoon, 1991).

Aloe juice has a blood-sugar lowering effect and also enhances the effect of the oral diabetes drug Glibenklamid (Yongchaiyudha et al., 1996; Bunyapraphatsara et al., 1996).

Fourty published clinical trials, in vitro and in vivo studies on the effects of Aloe vera were recently analyzed, which resulted in the following observations (Feily & Namazi, 2009):

“The results suggest that oral administration of aloe vera in mice is effective on wound healing, can decrease the number and size of papillomas and reduce the incidence of tumors and leishmania parasitemia by >90% in the liver, spleen, and bone marrow. Topical application of aloe vera is not an effective prevention for radiation-induced injuries and has no sunburn or suntan protection. It can be effective for genital herpes, psoriasis, human papiloma virus, seborrheic dermatitis, aphthous stomatitis, xerosis, lichen planus, frostbite, burn, wound healing and inflammation. It can also be used as a biological vehicle and an anti-microbial and antifungal agent and also as a candidate for photodynamic therapy of some kinds of cancer.”
2.6 Interactions

As previously mentioned, aloe juice enhances the hypoglycemic effect of Glibenclamide when it is given to diabetes patients (Yongchaiyudha et al., 1996; Bunyapraphatsara et al., 1996) and improves the local anti-inflammatory effect of cortisone (Davis et al., 1991). Aloe vera gel contains water soluble, hydrocolloidal plant fibers that delay gastric emptying and create a mucilaginous intestinal environment, which inhibits the absorption of dietary and pharmaceutical agents. Overuse or misuse of laxative aloe preparations can cause excessive potassium loss, leading to increased toxicity of drugs containing cardiac glycosides (Wichtl, 1989; Meletis & Jacobs, 1999).

2.7 Toxicology

The dried latex from the superficial pericycle cells has the same side effects as other peristalsis stimulating laxatives, but aloe has a more drastic and irritant action than Senna (Reynolds, 1993). Aloe is contra-indicated during pregnancy, menstruation and hemorrhoids due to hyperemia of the pelvic organs (Wagner, 1993). An overdose may cause severe abdominal pain, bleeding gastritis and inflammation of the kidneys (Leung, 1980). However, the fresh aloe juice/gel normally does not give any side effects. Occasionally the local application of aloe gel may cause an acute skin rash, which usually soon disappears with continued use (Juneby, 1999).

2.8 Medicinal use

Externally, fresh aloe gel often has a very good effect in acne, pimples, eczema and other skin problems, poorly healing wounds, leg ulcers, burns due to excessive heat, sun exposure and in the treatment of radiation dermatitis. Internally, aloe juice can be used in gastro-enteritis and peptic ulcers. The dried latex, with a high barbaloin content, is a strong laxative, but its use should be limited to no more than one week, and it should not be used during menstruation, pregnancy and nursing. The suggested medicinal use of Aloe vera is based on its historic and traditional use, and an analysis of modern pharmacologic and toxicologic research (Juneby, 1999). See also the additional information under pharmacology, interactions and toxicology.
2.9 Preparations and dosages

*Aloe succus* (juice/gel), 15 – 30 ml. 1 – 2 tablespoons are taken on an empty stomach or between meals 2 – 3 times a day. Externally the gel is applied to the affected area 2 – 3 times a day as needed. As a laxative, 50 – 300 mg aloe powder or a dry extract is taken in the evening for temporary constipation (Bradley, 1992; Wagner, 1993).

Fig. 4. From left to right: *Aloe vera* concentrated juice/gel (a raw material) and a sun burn gel from Florida, USA. *Aloe vera* gel and a soap bar from Sweden. Photo: © H B Juneby.
3 Discussion

Reynolds (1993, p. 869), makes the following critical observations about the uses and administration of *Aloe vera* gel, referring to critical articles by Hecht (1981) and Marshall (1990):

“It is widely used in cosmetics and toiletries for a reported moisturising and revitalising action. There are also now claims for the beneficial and even curative properties of aloe vera gel in the self-treatment of medical conditions such as acne, hemorrhoids, psoriasis, anemia, arthritis, burns, cancer, depression, diabetes, glaucoma, multiple sclerosis, peptic ulcer, tuberculosis, and even blindness. There is no evidence to support these claims.”

This negative view is at one extreme end of the question about the medicinal value of *Aloe vera* gel. At the other extreme is the view that the aloe juice/gel is a veritable panacea, which can be used to cure a great number of more or less serious ailments. As usual, the truth can most likely be found somewhere in the middle between the two extremes.

There is good evidence that fresh juice/gel from recently harvested aloe leaves has a local anti-inflammatory and healing effect on skin that has been damaged by sun exposure, etc. The presence of small amounts of barbaloin has an antiseptic effect, which may help the healing process by reducing the risk of infection. There are also other medicinal uses which have been quite well documented (Danhof, 1987).

Many commercial *Aloe vera* products have a quality that has been certified, but many others are not certified and may be of a questionable quality. This may explain why there are so many conflicting reports about the medicinal value of these medicinal, cosmetic and food products.

The best way to benefit from the healing properties of *Aloe vera* is probably to keep a potted plant in the house and use the gel from a fresh leaf whenever it is needed to treat minor burns and other conditions where it may have some medicinal value. This will also eliminate the need to worry about the quality and medicinal value of some commercial product.
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IASC, The International Aloe Science Council Certification Program.


