

Aloe vera: Plant of Immortality

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Introduction

The Egyptians called Aloe the “Plant of Immortality” because it can live and even bloom without soil. Aloe has been used medicinally since at least the first century C.E. and continues to be used extensively worldwide.

Synonyms

Grihakanya, Kanya, Ghritakumari, Vipulasrava, Sthuladala, Dirgha patra, Mandala, Kumari

Biological source

Dried juice of *Aloe ferox* Mill, *A. perryi* Baker, *A. vera* (L.) N.L. Burm.(= *A. barbadensis* Mill.)

Botanical name

Aloe ferox Mill, *A. perryi* Baker, *A. vera* (L.) N.L. Burm. (= *A. barbadensis* Mill.)

Family: Liliaceae

Geographical source

Aloes is indigenous to eastern and southern Africa and grown in cape colony, Zanzibar and islands of Socotra, also cultivated in Europe and many parts of India including northwest Himalayan region.¹

Commercial Use

Distinct parts of the aloe plant and various species are used medicinally. The gel from the fresh leaf is used in a wide range of internal and external applications. The internal use of the gel is regulated as a dietary supplement. The dried latex taken from the bundle sheath cells within the leaf is primarily used as a laxative. It is an official drug in the *U.S. Pharmacopeia*.²

Commercially significant species are *Aloe ferox* Miller (Cape Aloes), *A. perryi* Baker (Socotrine Aloes) and *A. vera* (Barbados or Curaçao Aloes). However, many names have been used to describe Aloe, such as *A. barbadensis* and *A. vulgaris*. Currently, the correct name is *Aloe vera* (L.) Burm. f.² In trade, the full botanical name, Aloe vera, is used to refer to gel products.

Careful processing of aloe gel is necessary to maintain activity. Aloe is processed using the hand-filleted or whole leaf procedure. Hand-filleted processing carefully removes the inner gel while avoiding the yellow sap (latex) found next to the rind. The latex contains aloin, which is removed for internal and external gel products. Whole leaf extracts are made by grinding the entire leaf and then removing the aloin through charcoal filtration at the final stage of processing. The goal of whole leaf processing is to retain as many polysaccharides (complex sugars) as possible, since they have been shown to be partially responsible for aloe's therapeutic efficacy.³ Stabilizing the constituents within aloe is another essential part of developing effective products. The gel must be cool-processed within four hours of harvesting. Tests on some commercial aloe gel products found that processing can decrease the amount of the active ingredients present in the fresh gel. The International Aloe Science Council provides a seal of certification for products that have followed proper processing procedures. The latex sold as the official drug is made from a solid residue processed by draining the liquid from transversely cut aloe leaves.⁴

Botany

Since Aloe has naturalized throughout the tropics and warm regions worldwide, its true origin is not known. It is suspected to have come from North Africa or the Nile region in Sudan. The genus contains at least 324 species

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of herbs, shrubs, and trees, primarily African, with some in Madagascar and the Arabian Peninsula. Aloe is a perennial, with 15 to 30 fleshy leaves up to 0.5 m long and 8 to 10 cm across at the base. Saw-like teeth mark the margins of the leaves.⁵

History

Aloe has played a significant medicinal role for thousands of years. Egyptians, Assyrians, and Mediterranean peoples used the dried latex primarily, but also the gel. In Egypt, aloe was called “the plant of immortality” and was given as an offering at the funerals of pharaohs and used in the baths of Egyptian queens Nefertiti and Cleopatra. According to the Roman scholar, Pliny, the plant was also used for embalming. Alexander the Great conquered Socotra Island, reportedly at the request of Aristotle, just to obtain aloe. In the first century C.E., the Greek physician Dioscorides used aloe for mouth infections, sores, wounds and as a purgative. In the 10th century, aloe was used in England and during the 17th century, records show that the East India Company frequently purchased aloe from the king of Socotra. Today, Egyptians still hang an aloe plant over the door of a new house to provide a long and fruitful life for its occupants. In India the whole leaves, exudate, and fresh gel aloe are used as a cathartic, stomachic, emmenagogue, and anthelmintic. In China, Mexico, and the West Indies, it has become a common household remedy for a variety of uses. Until the 1930s in the U.S., the primary commercial use of aloe was the dried latex as a laxative.⁵

Modern Use

In preliminary human clinical studies, the gel has shown significant results in the treatment of asthma, peptic ulcers, and diabetes mellitus.² The gel has been sold in the health food market as a tonic, as well as for “supporting the immune system” and “supporting healthy breathing”. Externally, the gel has been used in many ways: cosmetics, dermabrasion, wound-healing, and psoriasis. In cosmetics, the gel is added to moisturizers, cleansers, shampoos, suntan lotions, and sunburn treatments.⁶

The drug derived from aloe latex is part of one of the strongest anthraquinone groups that function as stimulant laxatives. The latex is officially approved as a laxative in the U.S., England, and Germany. The German Commission E recommends the use of aloe for occasional constipation and for conditions that require a soft stool, such as anal fissures, hemorrhoids, and after rectal or anal surgery.⁷ Externally, the latex is used like the gel and as a soothing agent in treating burns and mild cuts.⁸

Chemistry

Gel

The primary constituents of the gel are polysaccharides and water. Acemannan, a fraction obtained from the gel, may be related to the reported wound healing, antiviral and immune-stimulating activities of aloe. Other constituents include lipids, amino acids, enzymes, and sterols.⁶

- The internal use of the gel is approved by the FDA only as a “dietary supplement.” Manufacturers cannot claim that their products can cure, treat, or prevent any disease.
- The external use of the gel is approved by the FDA only as a cosmetic ingredient.

Latex

The main active constituents of the latex are anthraquinones, including the hydroxyanthracene derivatives 25-40 percent aloins A and B, barbaloin, isobarbaloin, and emodin⁸. *A. perryi* contains approximately 25 to 28 percent aloin and *A. ferox* approximately 10 percent. Also included are 3 to 4 percent 7-hydroxyaloins A and B, aloemodin, resins, aloesin and its aglycone aloesone, chromone derivatives and chrysophanol⁴.

Animal Studies

Aloe gel has demonstrated wound healing, anti-inflammatory, antiviral, spermicidal, and gastroprotective properties.^{3,9}

It has also shown immune-stimulating and cholesterol-lowering activity.¹⁰

Aloe gel is thought to speed recovery from wounds by enhancing the activity of macrophages and fibroblasts. A recent study showed aloe to be more effective than conventional treatments for burns, frostbite, and intra-arterial damage from intravenous drug abuse, as well as tissue injuries from electrical shocks. Aloe gel also helped speed the rate of wound closure and the resistance of the healed wound to tearing. Its wound-healing activity has been partially attributed to the polysaccharide, mannose-6-phosphate.³

It has been suggested that aloe works as an anti-inflammatory when used topically and when taken orally. An animal study examined the anti-inflammatory activity of extracts derived from aloe gel. The researchers

concluded that the action may be due to inhibition of the arachidonic acid pathway through cyclooxygenase. Another study inhibited edema in mice by 37 percent and attributed the activity to the sterol compounds in aloe, especially lupeol.^{3,9 3,93,9}

Antiviral activity was shown in an in vitro study using a purified extract from the gel of *Aloe barbadensis*. The main activity against cytomegalovirus was shown 12-36 hours after infection. An in vitro study using zinc acetate and lyophilized *Aloe barbadensis* (7.5 and 10 percent) demonstrated an antiviral and spermicidal effect. The authors concluded that it might be useful as a contraceptive, especially significant in preventing the transmission of HIV. Spermicidal activity from Aloe was thought to be due to microelements (boron, barium, calcium, chromium, copper, iron, potassium, magnesium, manganese, phosphorus, and zinc) that immobilize the tails of sperm without causing vaginal irritation.

Gastroprotective properties were shown in several animal studies. When aloe gel was administered to rats prior to ulcer-inducing stress, the number of ulcers decreased by 80 percent. After developing ulcers, the animals given aloe gel recovered three times faster than the control animals. Another animal study demonstrated similar results. The triterpenoids contained in aloe were found to protect against the formation of gastric ulcers.¹⁰

Research on immune stimulation in mice has indicated that acemannan, a polysaccharide within aloe, has demonstrated dose-dependent macrophage activation. When given orally to animals, mannans have also been shown to inhibit cholesterol absorption and lower cholesterol.

The pharmacological difference between aloe gel and aloe latex is that the gel does not contain any anthraquinone compounds and does not, therefore, exert any laxative action. Anthraquinones induce secretion of water and electrolytes into the lumen of the gut and inhibit the absorption of electrolytes and water by the colon. This action in turn activates peristalsis^{6,8}. Aloe-emodin, a degradation product of B-glycosides in the colon, is the laxative metabolite⁶. Animal studies have found that aloe-emodin and an alcoholic extract of aloe possess antitumor and anticancer activity. In vitro research has reported that aloctin A could induce cells cytotoxic to syngenic and allogenic tumor. However, the National Cancer Institute is no longer studying the latex as an anticancer treatment.

Recent Human Clinical Studies

Clinical studies have focused upon the external use of aloe gel for wound healing and psoriasis. In a study that compared aloe to polyethylene oxide gel dressing in the treatment of patients with dermabrasion (surgery to remove tattoos, acne, scars, and wrinkles), aloe accelerated healing by 72 hours. The wounds of patients recovering from burns, frostbite, and intra-arterial drug abuse healed faster, had less tissue loss or morbidity, and fewer complications than those patients treated with conventional methods. Seven percent of the frostbite patients treated with aloe required amputation, compared with 32 percent in the nontreatment group. In another study, aloe also was shown to assist patients recovering from wounds associated with frostbite. One study contradicted these results by showing a delay of 30 days in the healing of wounds on patients treated with aloe gel. A double blind, placebo-controlled study examined the effect of aloe extract (0.5 percent in a hydrophilic cream) for 60 psoriasis vulgaris patients, aged 18 to 50 years. The aloe cream cured 25 out of 30 patients compared to a placebo rate of 2 out of 30. The authors concluded it was a safe alternative treatment for treating psoriasis.¹⁰

The internal use of the gel has been studied for treating asthma, peptic ulcers, and diabetes mellitus. A clinical study found that a fraction of aloe extract enhanced phagocytosis (causing the elimination of bacteria and dust particles) in adult bronchial asthma. Another study examined the effect of aloe on the blood sugar levels of 50 men and 22 women with a diabetic curve on glucose tolerance tests. By week two, cholesterol levels were unchanged, but changes to blood sugar levels and triglyceride levels were statistically significant. A small study of 12 peptic ulcer patients reported positive results from treatment with aloe. The results were attributed to the inhibition of hydrochloric acid secretion, coagulation of pepsin and general detoxification.^{6,7}

Safety

Aloe vera gel should not be used externally after laparotomy or caesarean delivery because it may delay wound healing. Drug aloe should not be taken for more than 10 days. It should not be used by pregnant or lactating women and is contraindicated in the following conditions: intestinal obstruction or inflammation (e.g., appendicitis, colitis, Crohn's disease, irritable bowel syndrome, etc.), abdominal pain of unknown origin, hemorrhoids, kidney dysfunction, menstruation, and in children less than 12 years old.¹⁰

U.S. Regulatory Status:

Internal-approved for use as a dietary supplement with "structure/function" claims allowed as long as they do not claim to diagnose, cure, treat or prevent any disease and carry a disclaimer on the product label to this effect.

According to current FDA-proposed regulations, examples of acceptable structure/function claims include “Supports the immune system” and “Supports a healthy heart,” while claims such as “Helps treat AIDS,” and “Helps prevent cancer” are considered unacceptable, as these are considered drug claims.

External-approved for use as a cosmetic ingredient. Drug claims and structure/function claims are not allowed. Claims regarding cleansing and beautifying such as “moistens,” “soothes,” and “softens” are allowed.

U.S. Regulatory approval: Approved in 1975 by the FDA as an over-the-counter drug to treat constipation. Proposed as Category 3 in 1998. The FDA required manufacturers to submit additional safety data by June 21, 1999, and it may restrict over-the-counter sale of aloe latex for constipation.

Conclusion

Aloe has attracted much attention worldwide for its medicinal uses. Aloe latex is approved as a potent laxative drug in the U.S., as well as in the U.K., France, and Germany. The external use of aloe gel for minor wounds, burns, and frostbite has been established through extensive use and recent pharmacological and clinical studies. The internal use of the aloe gel for asthma, mouth ulcers, peptic ulcers as well and many other potential uses needs additional study. Since the 1st century C.E., aloe has provided humankind with numerous valuable medicinal products. Human clinical studies continue to substantiate its therapeutic use.

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