

Aloe vera on skin

V. Lavanya¹, Dhanraj Ganapathy^{2*}, R. M. Visalakshi²

ABSTRACT

The aim of the review is to give an insight into the role of *Aloe vera* on skin and its therapeutic properties. *A. vera* is a succulent plant species of the genus Aloe. An evergreen perennial, it originates from the Arabian Peninsula but grows wild in tropical climates around the world and is cultivated for agricultural and medicinal uses. *A. vera*, sometimes described as a “wonder plant,” is a short-stemmed shrub. The leaves of *A. vera* are succulent, erect, and form a dense rosette. Many uses are made of the gel obtained from the plant’s leaves. This topic will review the classification and brief description of *A. vera* on skin and its therapeutic properties

KEY WORDS: *Aloe vera*, Medicinal, Shrub, Skin, Therapeutic

INTRODUCTION

Aloe vera is a naturally occurring product that is nowadays frequently used in the field of cosmetology. There are various indications for its use.^[1] *A. vera* is a tender plant that belongs to the species of the genus Aloe. It is a perennial plant and it arises from the Arabian Peninsula but mostly seen in tropical climates around the world and is cultivated and they are used for agricultural and medicinal uses. The species is also used for decorative purposes and they are grown in indoors as a potted plant.^[2] It is found in many consumer products including cool drinks, skin lotion, cosmetics, or ointments for small burns and sunburns. There is a scientific evidence of the effectiveness or benefits of *A. vera* extracts for both cosmetic and medicinal purposes. *A. vera* has been used for medicinal purposes in several cultures for millennia; they include Greece, Egypt, India, Mexico, Japan, and China. Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty products. Alexander the Great and Christopher Columbus used it to treat their soldier’s wounds.^[3] *A. vera* has also been used as a laxative in the United States, but in the mid-1930s, a turning point occurred when it was successfully used to treat chronic and severe radiation dermatitis.^[4]

The skin also plays an important role in protection of the body internal environment and it is the largest organ in human’s body so damage to the skin of serious damage to this organ may cause several problems in the living system. Skin is composed of two layers of epidermis and dermis that they are placed over the subcutaneous adipose tissue. Epidermis mostly contains keratinocyte layers in which some other types of cells like melanocytes and Langerhans cells are also found. Epidermis has been separated from dermis by the basement membrane. Dermis contains papillary and reticular cells that comprise extracellular matrix or the basal substance and that contain collagen, fibrous meshwork, elastin, and glycosaminoglycans. Despite various modern skin cares and treatments using herbal products like *A. vera* play an important role in wound healing, especially in alternative medicine.^[5]

The other names of *A. vera* include Cape aloe, Aloe curacao, Barbados aloe, Venezuela aloe, Indian alces, Ghirita, Lu hui, and Star. It is also known as miracle plant, burn plant, medicine plant, and first aid plant.^[6] *A. vera* grows up to a height of about 12–16 inches. It is composed of fibrous root system and it does not have stems. It has thick leaves with sharp points, which are up to 18 inches long and 2 inches wider at the base of the leaf. Its leaves are even long and it is seen in triangular in shape. The tissue is in the center of *A. vera*. Aloe leaf contains a gel which yields the aloe gel. The leaves of *A. vera* contain much amount of water content and that is the reason why the plant

Access this article online

Website: jprsolutions.info

ISSN: 0975-7619

¹Department of Prosthodontics, Saveetha Dental College, Chennai, Tamil Nadu, India, ²Department of Prosthodontics, Saveetha Dental College, Chennai, Tamil Nadu, India

*Corresponding author: Dr. Dhanraj Ganapathy, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, 162, Poonamallee High Road, Chennai - 600 077, Tamil Nadu, India. Tel.: +91-9841504523. E-mail: dhanrajmaganapathy@yahoo.co.in

Received on: 19-11-2018; Revised on: 27-12-2018; Accepted on: 22-01-2019

survives for more years. Leaves have spiky margins and are blotched creams. It is the member of the Lilly family. The roots of the plant are thick and fibrous in nature. The fruit in the triangular capsule contains numerous seeds.

A. vera plant is composed of many groups of enzymes like anthracene hydroxyl derivatives including aloins A and B2 with total 25–40% of chromone compounds and derivatives such as aloe resins A, B2, and C. The other important compounds in *A. vera* plant that include several sugars compounds such as glucose, mannose, and cellulose and various enzymes like oxidase, amylase, and catalase and also vitamins consisting of B1, B2, B6, C, E, and folic acid, and minerals like calcium, sodium, magnesium, zinc, copper, and chrome.

A. vera is the plant that belongs to the Liliaceae family that grows mostly in hot and arid regions. The existing mucilage tissue at the center of leaves in this plant that is also called as aloe gel is used for various cosmetics and medical applications.^[9] The peripheral leaf cells in this plant produce bitter and yellow color latex that is called aloes. *A. vera* is one of the plants, which can be noticed in this regard.

A. vera or yellow aloe is the herbaceous and perennial plant, which is thick, tender, and has long leaves. The margin of its leaves is a little curled with thistle. Its flowers are placed in beautiful clustered form at the end of fluorescent stem axis with green to yellow color. *A. vera* is endemic to African regions and it is also called desert lily.^[10]

The Egyptians used *A. vera* plant for the treatment of wounds, burnings, and infections and then after them, Greeks, Spanish, and African peoples used *A. vera* plant by various techniques for several purposes. According to classic medicine in Iran, *A. vera* has hot and dry humor and its extract is used for medicinal purpose in many ways.^[11,12]

Active components with its properties: *A. vera* contains almost 75 types of potentially active constituents that include vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids.

Vitamins

It contains Vitamins A, C, and E, which act as antioxidants. It also contains Vitamin B12, folic acid, and choline. Antioxidant helps to neutralize free radicals.^[15]

Enzymes

It contains eight enzymes, which includes aliase, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulase, lipase, and

peroxidase. Bradykinase that helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

Minerals

A. vera provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium, and zinc. They are needed for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.

Sugars

A. vera produce monosaccharide such as glucose and fructose and it also produces polysaccharides such as glucomannans/polymannose. These are obtained from the mucilage layer of the plant and are known as mucopolysaccharides. The most important monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans. Acemannan, a prominent glucomannan, has also been found. Recently, a glycoprotein with antiallergic properties, called alprogen and anti-inflammatory compound, C-glucosylchromone, has been isolated from *A. vera* gel.^[16,17]

Fatty Acids

It produces four types of plant steroids that include cholesterol, campesterol, β -sitosterol, and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.

Hormones

It produces auxins and gibberellins, which will help in wound healing and has anti-inflammatory action.

MECHANISM OF ACTION

Healing Properties

Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interact with growth factor receptors on the fibroblast, thereby increasing its activity and proliferation, which, in turn, increases the collagen synthesis after topical and oral *A. vera*. Aloe gel not only increases the collagen content of the wound but also altered collagen composition (more Type III) and increased in the degree of collagen cross-linking. Due to this, it accelerates the wound contraction and increases the breaking strength of resulting scar tissue. Increased synthesis of hyaluronic acid and dermatan sulfate in the granulation tissue of a healing wound following oral or topical treatment has been reported.

Anti-inflammatory Action

A. vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. The anti-inflammatory compound in *A. vera*

called C-glucosylchromone was isolated from gel extracts of *A. vera*.^[18]

Laxative Effects

Antraquinones present in latex is an important laxative. It increases intestinal water content, which stimulates mucus secretion and increases intestinal peristalsis. Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast, which produces the collagen and elastin fibers making the skin more elastic and less wrinkled and reduces shrinkage. It also has binding effects on the superficial epidermal cells by binding them together, which help to soften the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores and reduces it. Its moisturizing effects have also been studied in the treatment of dry skin associated with occupational exposure where *A. vera* gel gloves improved the skin integrity, decreases the appearance of wrinkle, and decreases erythema. It also has anti-acne effect.^[19]

Antiseptic Effect

A. vera contains six types of antiseptic agents that include lupeol, salicylic acid, urea nitrogen, cinnamic acid, phenols, and sulfur. They all have inhibitory action against fungi, bacteria, and viruses.^[20]

A. vera plant is cultivated from the seed. It requires a well-drained sandy soil in sunny location. *A. vera* needs a temperature of about 40°C. They should be cultivated in the spring season and watered carefully until they are formed. It grows in the arid climate. They should be watered regularly in the summers. However, overwatering can cause damage to the plant. It also grows in partial shade. It reaches the maturity in 4 years when the leaves are harvested.^[21]

A. vera is the herbal plant, used to heal burns marks. *A. vera* cures various skin diseases. It can also be applied over the scalp as it helps to remove dandruff from the hair. *A. vera* is administered internally for the stomach disorders. The leaves of *A. vera* are also used for the treatment of facial edema or swelling. The gel obtained from *A. vera* is beneficial in reducing the inflammation and pain. *A. vera* is also used in cosmetics and even in the food industry. Curacao aloe acts as laxative, which is used in case of constipation. The fresh juice of its leaf blades can be applied directly to the ulcers, burns, sunburns, and fungal infection. Organic *A. vera* juice reduces acidity. It prevents from fungus, influenza virus, measles, and high fever.^[22]

People uses aloe gel to the skin for acne, an inflammatory skin condition called lichen planus, inflammation in the mouth, burning mouth, radiation-induced skin damage, dental plaque, diaper rash, frostbite, gingival disease, bedsores, scabies, dandruff,

wound healing, hemorrhoids, and pain after surgery to remove internal hemorrhoids, osteoarthritis, inflammation, and as an antiseptic. Aloe extract and aloe gel are also applied to the skin for genital herpes, scaly and itchy skin, burns, sunburns, and dry skin as it reduces the inflammations. Aloe extract is also applied to the skin as an insect repellent. Aloe leaf juice is also applied to the skin for anal fissures. A chemical found in aloe called acemannan is applied to the skin for dry sockets in the mouth and canker sores. The most useful parts of aloe are the gel and latex. The gel is obtained from the cells in the center of the leaf, and the latex is obtained from the cells beneath the leaf skin.

Aloe gel can cause changes in the skin that might aggravate diseases like psoriasis.

Aloe helps to speed wound healing by increasing the blood circulation through the area and preventing cell death around the wound.

It also found that aloe gel has certain properties that are harmful to certain types of bacteria and fungi.

Aloe latex contains chemicals that are used as a laxative.

SIDE EFFECTS

Topical: It will lead to redness, burning, stinging sensation, and rarely dermatitis in sensitive individuals those who are allergic to plants. Allergic reactions are mostly due to anthraquinones that include aloin and barbaloin. It is safer to apply it on a small area first to test for possible allergic reaction.^[14]

Gastro Intestinal

Intestinal problems like Abdominal cramps, diarrhea, red urine, hepatitis, dependency or lead to worsening of constipation. Prolonged use of *A. vera* has been reported to increase the risk of colorectal cancer. Laxative effect may cause electrolyte imbalances.

Contraindication

Contraindicated in people those who are known allergic to plants in the Liliaceae family. Pregnancy and breastfeeding: Oral aloe is not recommended during pregnancy as it leads to uterine contractions, and also in breastfeeding mothers, it will lead to gastrointestinal distress in the nursing infant.^[23-25]

Interactions

Application of aloe to skin leads to increase in the absorption of steroid creams such as hydrocortisone. It reduces the effectiveness and may increase the adverse effects of digoxin and digitoxin, due to potassium-lowering effect. Combined use of *A.*

vera along with furosemide may increase the risk of potassium depletion. It decreases the blood sugar levels and it may interact with oral hypoglycemic drugs and insulin.

When *A. vera* gel is administered as a topical agent, it is generally considered as safe. Aloe gel enhances the ability of hydrocortisone to reduce swelling if applied topically over it. If it is ingested, it may lead to increased hypoglycemia in conjunction with oral antidiabetics or insulin.^[26] The American Pharmaceutical Association rates *A. vera* gel for external use in category 2, meaning that “according to a number of well-designed studies and common use, this substance appears to be relatively effective and safe when used in appropriate amounts.” *A. vera* inner gel may significantly increase the absorption of Vitamins C and E after oral application. *A. vera* gel for systemic application is not recommended in combination with antidiabetics, diuretic, or laxative drugs; sevoflurane; or digoxin. In general, a 2-h time period is needed between oral drug application and *A. vera* ingestion due to increased intestinal motility and reduced drug absorption. If *A. vera* gel is used with any other prescription drug, the patient should inform the physician and pharmacist.^[26-29]

CONCLUSION

Even though *A. vera* has wide spectrum of the properties and uses, some of them could be myths and some of them could be real. In future, controlled studies are required to prove the effectiveness of *A. vera* under various conditions.

REFERENCES

- Surjushe A, Vasani R, Saple DG. *Aloe vera*: A short review. *Indian J Dermatol* 2008;53:163-6.
- Perkins, Cyndi. Is Aloe a Tropical Plant? Available from: <http://www.SFgate.com>. [Last retrieved on 2016 Feb 13].
- Tyler V. *The Honest Herbal: A Sensible Guide to the Use of Herbs and Related Remedies*. 3rd ed. Binghamton, New York: Pharmaceutical Products Press; 1993.
- Davis RH. *Aloe vera: A Scientific Approach*. New York: Vantage Press; 1997.
- West DP, Zhu YF. Evaluation of *Aloe vera* gel gloves in the treatment of dry skin associated with occupational exposure. *Am J Infect Control* 2003;31:40-2.
- Zawahry ME, Hegazy MR, Helal M. Use of aloe in treating leg ulcers and dermatoses. *Int J Dermatol* 1973;12:68-73.
- Atherton P. *Aloe vera* revisited. *Br J Phytother* 1998;4:76-83.
- Shelton RM. *Aloe vera*. Its chemical and therapeutic properties. *Int J Dermatol* 1991;30:679-83.
- Atherton P. *The Essential Aloe vera: The Actions and the Evidence*. 2nd ed. Oxford: Mill Enterprises; 1997.
- Chithra P, Sajithlal GB, Chandrakasan G. Influence of *Aloe vera* on collagen characteristics in healing dermal wounds in rats. *Mol Cell Biochem* 1998;181:71-6.
- Hegggers JP, Kucukcelebi A, Listengarten D, Stabenau J, Ko F, Broemeling LD, *et al.* Beneficial effect of aloe on wound healing in an excisional wound model. *J Altern Complement Med* 1996;2:271-7.
- Chithra P, Sajithlal GB, Chandrakasan G. Influence of *Aloe vera* on the glycosaminoglycans in the matrix of healing dermal wounds in rats. *J Ethnopharmacol* 1998;59:179-86.
- Roberts DB, Travis EL. Acemannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice. *Int J Radiat Oncol Biol Phys* 1995;32:1047-52.
- Peng SY, Norman J, Curtin G, Corrier D, McDaniel HR, Busbee D, *et al.* Decreased mortality of norman murine sarcoma in mice treated with the immunomodulator, acemannan. *Mol Biother* 1991;3:79-87.
- Hart LA, Nibbering PH, van den Barselaar MT, van Dijk H, van den Berg AJ, Labadie RP, *et al.* Effects of low molecular constituents from *Aloe vera* gel on oxidative metabolism and cytotoxic and bactericidal activities of human neutrophils. *Int J Immunopharmacol* 1990;12:427-34.
- Davis RH, Donato JJ, Hartman GM, Haas RC. Anti-inflammatory and wound healing activity of a growth substance in *Aloe vera*. *Journal of the American Podiatric Medical Association* 1994;84:77-81.
- Syed TA, Afzal M, Ashfaq AS. Management of genital herpes in men with 0.5% *Aloe vera* extract in a hydrophilic cream a placebo-controlled double-blind study. *J Dermatol Treat* 1997;8:99-102.
- Furukawa F, Nishikawa A, Chihara T, Shimpo K, Beppu H, Kuzuya H, *et al.* Chemopreventive effects of aloe arborescens on N-nitrosobis(2-oxopropyl)amine-induced pancreatic carcinogenesis in hamsters. *Cancer Lett* 2002;178:117-22.
- Montaner JS, Gill J, Singer J, Raboud J, Arseneau R, McLean BD, *et al.* Double-blind placebo-controlled pilot trial of acemannan in advanced human immunodeficiency virus disease. *J Acquir Immune Defic Syndr Hum Retrovirol* 1996;12:153-7.
- Bitar MS, Labbad ZN. Transforming growth factor-beta and insulin-like growth factor-I in relation to diabetes-induced impairment of wound healing. *J Surg Res* 1996;61:113-9.
- Hamman J. Composition and applications of *Aloe vera* leaf gel. *Molecules* 2008;13:1599-616.
- Pomahac B, Svensjö T, Yao F, Brown H, Eriksson E. Tissue engineering of skin. *Crit Rev Oral Biol Med* 1998;9:333-44.
- Barcroft A, Myskja A, Reynolds T. *Aloe vera: Nature's Silent Healer*. New York, USA: BAAM; 2003.
- Amar S, Resham V, Saple D. *Aloe vera*: A short review. *Indian J Dermatol* 2008;53:163-6.
- Rosca-Casian O, Parvu M, Vlase L, Tamas M. Antifungal activity of *Aloe vera* leaves. *Fitoterapia* 2007;78:219-22.
- Rafieian M, Ansari R, Arami R, Sahinfard N, Namjou A, Shirzad H, *et al.* Effect of *Teucrium polium* and *Boswellia serrata* extracts on cotaneous burn wound healing in Balb/C mice. *J Shahrekord Univ Med Sci* 2011;12:49-53.
- Habeeb F, Shakir E, Bradbury F, Cameron P, Taravati MR, Drummond AJ, *et al.* Screening methods used to determine the anti-microbial properties of *Aloe vera* inner gel. *Methods* 2007;42:315-20.
- Vázquez B, Avila G, Segura D, Escalante B. Antiinflammatory activity of extracts from *Aloe vera* gel. *J Ethnopharmacol* 1996;55:69-75.
- Byeon SW, Pelley RP, Ullrich SE, Waller TA, Bucana CD, Strickland FM, *et al.* *Aloe barbadensis* extracts reduce the production of interleukin-10 after exposure to ultraviolet radiation. *J Invest Dermatol* 1998;110:811-7.

Source of support: Nil; Conflict of interest: None Declared