

ALOE-VERA: A HERB WITH MEDICINAL PROPERTIES

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ABSTRACT

In many parts of the world, there is a rich tradition of using herbal medicine for the treatment of many infectious diseases. Aloe-vera is one of the essential component of traditional medicine. Research is now directed to isolate biologically active compounds from plants for use as herbal medicine. Aloe Barbadensis Miller (Aloe-vera) belongs to the Liliaceal family, it is a cactus like plant and grows readily in hot and arid climate. This review highlights the importance of using Aloe-vera as a medicinal herb.

KEYWORDS: Aloe vera; Anti-bacterial

INTRODUCTION

The name aloe is derived from the Arabic word *alloe* meaning a shining bitter substance.^[1] The botanical name of Aloe vera is Aloe Barbadensis miller. It belongs to Asphodelaceae (Liliaceae) family, and is a shrubby or arborescent, perennial, xerophytica, succulent colony. It grows mainly in the dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.^[2] Aloe is also popular in both traditional Chinese and Ayurvedic medicine. In Ayurvedic medicine, the traditional medicine of India, aloe is used internally as a laxative, anti-helminthic, hemorrhoid remedy, and uterine stimulant; it is used topically, often in combination with licorice root, to treat eczema or psoriasis. In Arabian medicine, the fresh gel is rubbed on the forehead as a headache remedy or rubbed on the body to cool it in case of fever, as well as being used for wound healing, conjunctivitis, and as a disinfectant. Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids.^[2] The *Aloe barbadensis* plant consists of two different parts, each of which

produce substances with completely different compositions and therapeutic properties. The parenchymal tissue makes up the inner portion of the aloe leaves and produces the aloe vera gel (or mucilage), a clear, thin, tasteless, jelly-like material. This tissue is recovered from the leaf by separating the gel from the inner cellular debris. The other part of the plant is a group of specialized cells known as the *pericyclic tubules*, which occur just beneath the outer green rind of the leaf. These cells produce an exudates that consists of a bitter yellow latex with powerful laxative-like actions.^[2]

HISTORY

In Mesopotamia, clay tablets dated 1750 BC, showed that Aloe vera was being used in pharmaceutical manner. Egyptian books from 550 BC mentioned that infections of the skin could be cured by application of aloe. Aloe vera was used to treat eczema, and it has also been used as an insect repellent and as a laxative.^[3]

THE ALOE VERA PLANT

There are more than 300 species of Aloe plants. This plant has yellow flowers. The leaves are arranged in a rosette configuration, they are triangular and spear like and have thorny ridges.

The plant reaches maturity when it measures 1.5-4 feet long and has a base of 3 inches or greater in diameter.^[3] The *gel* or *mucilage* obtained from the flesh of the leaf contains quite different compounds from the bitter *latex* extracted from the leaf lining.^[4]

ALOE VERA CONSTITUENTS AND ITS PROPERTIES

Aloe gel is 99% water with a pH of 4.5 and is a common ingredient in many non-prescription skin salves. The gel contains an emollient polysaccharide, *glucomannan*. It is a good moisturizer, which accounts for its use in many cosmetics. *Acemannan*, the major carbohydrate fraction in the gel, is a water-soluble long chain mannose polymer which accelerates wound healing, modulates immune function (particularly macrophage activation and production of cytokines) and demonstrates antineoplastic and antiviral effects.^[5] The gel also contains *bradykininase*, an anti-inflammatory, *magnesium lactate*, which helps prevent itching, and salicylic acid and other *antiprostaglandin* compounds which relieve inflammation.^[6] Whole leaf components are proposed to have direct antibacterial properties include anthraquinones and saponins, while polysaccharides have been attributed within direct bacterial activity through the stimulation of phagocytic leucocytes to destroy bacteria. *Pryocatechol* is a hydroxylated phenol, known to be toxic to micro-organisms. The site and number of hydroxyl groups on the phenol group are thought to be related to their relative toxicity to microorganisms and the increase in hydroxylation. The phenolics group present in aloe vera extracts act by denaturing the proteins and cell membranes. They act as disinfectant and are effective in presence of organic matter and remain active even long after application.^[7] Numerous aloe species around the world are used for conditions ranging from dermatitis to cancer. There is growing experimental evidence for its use as an antiviral, an ulcer remedy and an adjuvant cancer treatment due to its immune modulating effects. The fresh gel or mucilage from *Aloe barbadensis* Mill. (family Liliaceae) – otherwise known as *aloe vera*: is a handy home grown remedy that can be used both as a moisturizing agent and for the treatment of minor burns, skin abrasions, and irritations.^[2]

FUNCTIONS^[8]

Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.

1. Vitamins: It contains vitamin A (beta-carotene) C and E, which are antioxidants. It also contains vitamin B₁₂, folic acid and choline.
2. Enzymes: It contains 8 enzymes: alliasse, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulose, lipase and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically.
3. Minerals: It provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. They are essential for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.
4. Sugars: It provides monosaccharides (glucose and fructose) and polysaccharides (glucomannans/polymannose). These are derived from the mucilage layer of the plant and are known as mucopolysaccharides. The most common polysaccharides are called glucomannans (beta -1,4 acetylated mannan) *Acemannan*, a prominent glucomannan has also been found. A glycoprotein with anti-allergic properties, called *alprogen* and novel anti-inflammatory compound, C-glucosylchromone, has been isolated from Aloe vera gel.
5. Anthraquinones: It provides 12 anthraquinones, which are phenolic compounds traditionally known as laxatives. *Aloin* and *emodin* act as analgesics, antibacterials and antivirals.
6. Fatty acids: It provides four plant steroids, cholesterol, campesterol, β -sisosterol and lupeol. All these have anti-inflammatory action and lopesol also possess antiseptic and analgesic properties.
7. Hormones: Auxins and gibberellins that help in wound healing and have anti-inflammatory action.
8. Others: It provides 20 of the 22 human required amino acids and 7 of the 8 essential amino acids. It also contains salicylic acid that possesses anti-inflammatory and anti-bacterial

properties. Lignin, an inert substance, when included in topical preparations enhances penetrative effect of the other ingredients into the skin.

THERAPEUTIC PROPERTIES OF ALOE VERA

Moisturizing actions

Moisturizing action is mainly due to the mix of water and polysaccharide components, creating a jelly-like consistency that holds the water within the mix and minimizes its evaporation, providing a sustained moist environment when applied to drying tissues and humectant properties that promote retention of moisture in tissues.^[9]

Wound healing effects

The aloe vera gel polysaccharide acemannan was shown to activate macrophages; an effect that improved wound healing in a rat model.^[10,11] A mannose-6-phosphate component of the gel has been credited with a wound healing effect.^[12]

Anti-inflammatory effects

Hanley et al., reported that an aloe vera extract (described as 5.0% leaf homogenate) decreased inflammation by 48% in a rat adjuvant-induced arthritic inflammatory model.^[13,14] More recently, the peptidase bradykinase was isolated from aloe and shown to break down the bradykinin, an inflammatory substance that induces pain.^[2]

Antibacterial/antifungal/antiviral effects

Streptococcus pyogenes and *Streptococcus faecalis* are two microorganisms that have been inhibited by aloe vera gel.^[15,16] Aloe vera gel reportedly was bactericidal against *Pseudomonas aeruginosa* while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture. A processed aloe vera gel preparation reportedly inhibited the growth of *Candida albicans*. In terms of antiviral effects, acemannan reduced herpes simplex infection in two cultured target cell lines.^[2]

USES OF ALOE IN DENTISTRY

A retrospective evaluation reviewed the records of 587 patients (totaling 1,031 sockets) whose extraction sites had been treated with clindamycin-soaked Gelfoam (Pfizer, Inc., New York, NY; 800.223.0182); in addition, a prospective study was performed in which 607 patients (1,064 sockets) each received two patches (Sali Cept Patches, Carrington Laboratories) with a freeze-dried pledget

containing acemannan hydrogel, a mixture of natural substances obtained from the clear inner gel of aloe vera, immediately after extraction.¹⁷ According to data restricted to the third molar extraction sites, the Gel foam retrospective analysis group produced 78 of 975 sites (8.0%) with alveolar osteitis; in the Sali Cept Patch prospective analysis group, 11 of 958 sites (1.1%) reported alveolar osteitis. The difference between the incidences of alveolar osteitis in the two groups was significant ($p < 0.0001$). Additional analysis of all extraction sites revealed an alveolar osteitis incidence of 7.6% in the Gel foam group, compared with 1.1% in the Sali Cept group ($p < 0.0001$). Based on these results, the investigators suggested that the Sali Cept Patch reduced the incidence of alveolar osteitis significantly compared to clindamycin-soaked Gel foam.^[2] According to a study, a patient was kept on aloe vera therapy for lichen planus with systemic involvement. The patient's treatment involved drinking 2.0 ounces of stabilized aloe vera juice daily for three months with additional topical application using aloe vera lip balm and aloe cream for itching hands. The oral lesions cleared up within four weeks, although the systemic lesions took longer, due in part to the fact that the patient temporarily interrupted the course of aloe therapy and sought an alternate source of treatment. Despite discontinuing the aloe therapy, complete success still was achieved. A Prototype acemannan was formulated into a denture adhesive and evaluated for adhesive strength in both wet and dry conditions; the adhesive also was used to evaluate cytotoxicity to human gingival fibroblasts.^[2] An *in-vitro* experimental study has confirmed the antimicrobial property of a commercially available *Aloe vera* containing tooth gel against common oral pathogens. The leaf and gel extracts of *Aloe vera* have varied antimicrobial spectrum. leaf extract of *Aloe vera* has better antibacterial property against *S. mutans* and *L. acidophilus* than its gel extract. *Aloe vera* is well tolerated by individuals without any toxic or adverse effects even after systemic administration.^[18]

CONCLUSION

Scientific evidence has brought about the possibility of the utilization of aloe extracts in the treatment of bacterial infections and development

of anti-bacterial and anti-fungal products. Furthermore, an anti-inflammatory property of aloe vera has also made a better understanding of its use as a potential drug in addition to contemporary drugs. Further research should be encouraged to utilize the herbs with medicinal properties.

BIBLIOGRAPHY

1. Ghazanfar SA. Handbook of Arabian medicinal plants. Boca Rato: CRC Press, 1994.
2. Richard LW .Aloe vera gel: Update for dentistry. Pharmacology Today. 2005:6-9.
3. Ronald MS. Aloe vera: Its chemical and therapeutic properties. Int J Dermatol. 1991;30:679-83.
4. Klein AD, Penneys NS. Aloe vera. J Am Acad Dermatol. 1988;18:714-20.
5. Peng SY, Norman J, Curtin G, Corrier D, McDaniel HR, Busbee D. Decreased mortality of Norman murine sarcoma in mice treated with the immunomodulator, Acemannan. Mol Biother. 1991;3:79-87.
6. Yagi A, Harada N, Yamada H, Iwadare SIN. Antibradykinin active material in *Aloe saponaria*. J Pharmaceut Sci. 1982;71:1172-74.
7. Lawrence R, Tripathi P, Jeyakumar E. Isolation, Purification and Evaluation of Antibacterial Agents from Aloe Vera. Journal of Microbiology. 2009;40:906-15.
8. Shelton RM. Aloe vera. Its chemical and therapeutic properties. Int J Dermatol. 1991;30:679-83.
9. Josias HH. Composition and Applications of Aloe vera Leaf Gel. Molecules. 2008;13(8):1599-1616.
10. Meadows TP. Aloe as a humectant in new skin preparations. Cosmetics Toiletries. 1980;95:51-56.
11. Maxwell B, Chinnah H, Tizard I. Activated macrophages accelerate wound healing in aged rats. Wound Repair Regeneration. 1996;4:165.
12. Tizard I, Busbee D, Maxwell B, Kemp MC. Effects of acemannan, a complex carbohydrate, on wound healing in young and aged rats. Wounds. 1994;6:201-9.
13. Davis RH, Donato JJ, Hartman GM, Haas RC. Anti-inflammatory and wound healing activity of a growth substance in aloe vera. J Am Pod Med Assoc. 1994;84:77-81.
14. Davis RH, Parker WL, Samson RT, Murdoch DP. Isolation of a stimulatory system in an aloe extract. J Am Podiatr Med Assoc. 1991;81:473-8.
15. Hanley DC, Solomon WA, Saffran B, Davis RH. The evaluation of natural substances in the treatment of adjuvant arthritis. J Am Podiatry Assoc. 1982;72:275-84.
16. Ito S, Teradaira R, Beppu H, Obata M, Nagatsu T, Fujita K. Properties and pharmacological activity of carboxypeptidase in *Aloe arborescens* Mill var. *natalensis* Berger. Phytotherapy Res. 1993;7:S26-S9.
17. Poor MR, Hall JE, Poor AS. Reduction in the incidence of alveolar osteitis in patients treated with the Sali Cept Patch, containing acemannan hydrogel. J Oral Maxillofac Surg. 2002;60:374-9.
18. Yavagal PC, Sivasamy S, Nagesh L. Evaluation of antibacterial potential of *Aloe vera* extracts against *Streptococcus mutans* and *Lactobacillus acidophilus* – An in-vitro study. JIAPHD. 2012;19:77-82.

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