



Review on Aloe vera

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Article info

Received: 10/02/2024

Revised: 19/04/2024

Accepted: 21/04/2024

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Abstract

Aloe vera is a natural product that is now a day frequently used in the field of cosmetology. Though there are various indications for its use, controlled trials are needed to determine its real efficacy. The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe "the plant of immortality." Today, the Aloe vera plant has been used for various purposes in dermatology. Aloe vera is gel from the leaves of aloe plants. People have used it for thousands of years for healing and softening the skin. Aloe has also long been a folk treatment for many maladies, including constipation and skin disorders. Modern-day research into aloe vera's benefits is mixed, with some evidence showing it can cause cancer in lab animals.

Key-words: Aloe vera, Uses, Medicinal importances

Introduction

Aloe vera, known for its therapeutic properties, has been used in folk medicine for centuries. Its documented uses date back to ancient Egypt, and references can be found in texts like the Bible. The plant's medicinal use gained traction in the 1930s, particularly for treating burns. Aloe vera gets its name from the Arabic word "Alloeh," meaning "shining bitter substance," due to the bitter liquid in its leaves.⁽¹⁾ It belongs to the Asphodelaceae family and is classified as Aloe vera by Carl Linnaeus.

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While most Aloe plants are nontoxic, Aloe vera is the most potent and widely cultivated species. Its natural range is unclear, but it originated in Africa and spread globally. Aloe vera is a stemless plant with triangular, fleshy leaves ranging in colour from grey green to bright green. The leaves consist of an inner gel, a yellow sap, and an outer thick layer. The gel, representing a significant portion of the leaf, serves as the plant's water and energy storage. Aloe vera can be divided into two basic products: latex and gel. The latex is a bitter yellow exudate, while the gel is a colourless, tasteless pulp. The gel contains water, sugars, and enzymes, while the latex has higher concentrations of latex components. The distinction between the gel and latex is challenging when using the whole leaf. ⁽²⁾

History

For centuries, Aloe vera has held a significant place in the realm of medicine across various cultures, including Greece, Egypt, India, Mexico, Japan, and China. Renowned figures such as Nefertiti, Cleopatra, Alexander the Great, and Christopher Columbus recognized its therapeutic value, incorporating it into beauty regimens and utilizing it for treating wounds. ⁽³⁾ The first mention of Aloe vera in English can be traced back to John Goodenough's translation in 1655 of Dioscorides' Medical treatise, *De Materia Medica*. While initially employed as a laxative in the early 1800s in the United States, its potential in medical applications gained prominence in the mid-1930s with successful treatment of severe radiation dermatitis. Aloe vera, a stemless succulent, exhibits thick fleshy leaves ranging in colour from green to grey-green, adorned with small white teeth along the serrated margins. During summer, the plant produces pendulous yellow tubular flowers on tall spikes. Additionally, Aloe vera forms arbuscular mycorrhiza, a beneficial symbiotic relationship enhancing its access to mineral nutrients in the soil. ⁽⁴⁾

Anatomy

The remarkable Aloe vera plant features triangular, fleshy leaves with serrated edges, vibrant yellow tubular flowers, and fruits filled with numerous seeds. The leaves themselves consist of three distinct layers. The inner layer

holds a transparent gel, composed mostly of water (approximately 99%), along with essential components like glucomannans, amino acids, lipids, sterols, and vitamins. ⁽⁵⁾ The middle layer is the bitter yellow sap known as latex, containing anthraquinones and glycosides. Finally, the outer layer, known as the rind, is a protective barrier consisting of 15-20 cells responsible for carbohydrate and protein synthesis. Within the rind lie vascular bundles responsible for transporting substances like water (xylem) and starch (phloem). Aloe vera boasts an impressive array of active components, including 75 potentially active constituents such as vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acid ⁽⁶⁾

Biological Components

Aloe vera latex and gel contain bioactive substances with various physiological effects, either acting independently or synergistically. The composition of Aloe vera can vary depending on factors such as climate, region, growing conditions, plant age, and processing methods. ⁽⁷⁾ The major components of Aloe vera include anthraquinones, phenolic compounds found in the latex, which exhibit potent laxative, antibacterial, analgesic, and antiviral properties. However, anthraquinones may also have harmful effects such as genotoxicity, mutagenicity, and tumor promotion. Aloe vera gel, on the other hand, is a rich source of polysaccharides, with acemannan being the most active among them. Acemannan has been associated with antiviral, antibacterial, wound healing, immunostimulatory, radiation-protective, and hematopoietic activities. The gel also contains water, polysaccharides, vitamins, enzymes, and steroids. ⁽⁸⁾ It is important to note that the gel's biological activities can degrade when exposed to air, leading to the recommendation of using fresh gel. While Aloe vera gel has demonstrated therapeutic benefits, there have been rare reports of adverse effects such as eczema, allergic dermatitis, and an increase in circulating leukocyte count, possibly due to immune system stimulation. ⁽⁹⁾

Mechanism of Actions-Uses and Applications

Aloe vera has a wide range of uses in **cosmetics**, **food**, and **medicine**. In cosmetics, Aloe vera gel, latex, and whole leaf extract is utilized for

their moisturizing and soothing properties. They can be found in various products such as moisturizers, cleansers, sun lotions, toothpastes, and shampoos.⁽¹⁰⁾

The concentration of Aloe vera in cosmetics typically ranges from 1 to 98%. When used in cosmetics, the level of anthraquinones, a component of Aloe vera, should not exceed 50 ppm to avoid phototoxicity. **The Food and Drug Administration (FDA)** in the United States has approved the external use of Aloe vera gel as a cosmetic ingredient.

(11) In **the food industry**, Aloe vera is used for functional food and beverages, including yogurt and health drinks like tea. Aloe vera gel can also be used as an edible coating for fresh products, helping to prolong their quality and safety by preserving functional compounds like phenolics and ascorbic acid. Aloe vera has antimicrobial properties, inhibiting the growth of microorganisms that cause foodborne illnesses and spoilage. It can be a natural and environmentally-friendly alternative to synthetic preservatives.⁽¹²⁾

Medicinally, Aloe vera has been used for wound healing due to its polysaccharides and the growth hormone gibberellins, which promote collagen and elastin formation. The presence of mucopolysaccharides (MPS) in Aloe vera contributes to its high healing capacity.⁽¹³⁾

Additionally, Aloe vera has shown effectiveness in treating **scar tissue** and preventing scar formation after **skin injuries**, potentially due to the presence of amino acids necessary for new cell formation.⁽¹⁴⁾

Aloe vera exhibits various beneficial effects on the skin and the body. Its enzymes promote the regeneration of deep skin layers, aiding in the healing process. The presence of salicylic acid in Aloe vera provides anti-inflammatory and analgesic properties, inhibiting the production of prostaglandin and making it useful for arthritis and joint-related issues.

Aloe polysaccharides enhance **immune activity**, while lectins may play a role in its therapeutic effects on **burns and ulcers**.⁽¹⁵⁾

Aloe vera has shown potential in treating **ulcers**, including **mouth ulcers**, **herpes simplex**, and **psoriasis**. It also protects against **gastric ulcers**.

The plant's **polysaccharides**, along with certain inorganic elements, contribute to its **antidiabetic** activities by reducing blood glucose and lipid levels. Aloe vera exhibits antioxidant properties similar to α -tocopherol, and its antioxidant activities vary with the growth stage of the plant.⁽¹⁶⁾

The anthraquinones present in **Aloe vera** latex act as **potent laxatives**, increasing intestinal peristalsis. It also exhibits antibacterial properties against various microorganisms, particularly Gram-positive bacteria responsible for food poisoning. While research on its antifungal activity is limited, Aloe vera has been reported to inhibit *Candida*. Furthermore, Aloe vera shows potential antiviral and antitumor effects, stimulating the immune system and possibly through anthraquinones.⁽¹⁷⁾

In studies conducted on pathogen-free rats, Aloe vera has demonstrated promising results in addressing age-related diseases. **Clinical trials** are ongoing to further investigate its potential use in treating **HIV-AIDS** and **cancer**.⁽¹⁸⁾

Medicinal Uses

Aloe vera has been found to have remarkable wound healing properties. The polysaccharides and gibberellins present in Aloe vera contribute to increased collagen and elastin formation, which can help reduce wrinkling and promote the healing of wounds. Aloe vera contains mucopolysaccharides (MPS) in significant quantities, ranging from 10,000 to 20,000 MPS per liter. These MPS play a crucial role in the high healing capacity of Aloe vera.⁽¹⁹⁾

In addition to wound healing, Aloe vera has shown effectiveness in treating scar tissue and preventing scar formation after skin injuries. This may be attributed to the activity of amino acids necessary for new cell formation. By promoting the regeneration of skin cells and supporting the synthesis of collagen and elastin, Aloe vera aids in the healing process, reducing the appearance of scars and promoting healthier skin. Aloe vera exhibits a wide range of beneficial effects on the human body, including anti-inflammatory action, immunity enhancement, effects on skin exposure to UV and X-radiation, treatment of ulcers, antidiabetic activities, antioxidant activities, laxative

effects, antibacterial properties, antifungal activity, and potential antiviral and antitumor activity.⁽²⁰⁾

Due to the presence of salicylic acid, Aloe vera has analgesic and anti-inflammatory properties. It inhibits the production of prostaglandins from arachidonic acid, making it useful for alleviating symptoms of arthritis and joint-related problems. Aloe polysaccharides contribute to enhanced immune activity.⁽²¹⁾

Aloe vera has been found to support the healing of first- and second-degree burns, although the exact mechanisms are not well understood. Lectin, a component of Aloe vera, is believed to play a role in its therapeutic effects.

In the treatment of ulcers, including mouth ulcers, herpes simplex, and psoriasis, Aloe vera has been successfully used. It has also been found to protect against the formation of gastric ulcers.⁽²²⁾

The polysaccharides present in Aloe vera, along with certain inorganic elements like vanadium, manganese, and copper, may contribute to its antidiabetic activities. Aloe vera has been linked to reduced blood glucose levels in diabetics and lower blood lipid levels or cholesterol in hyperlipidaemic patients.

Aloe vera exhibits antioxidant activities comparable to α -tocopherol (vitamin E), and its antioxidant potential may vary depending on the growth stage of the plant.

Antraquinones present in Aloe vera latex have laxative effects, increasing intestinal peristalsis.⁽²³⁾

Aloe vera possesses antibacterial properties, inhibiting the growth of microorganisms such as *Streptococcus pyogenes*, *Shigella flexneri*, and *Klebsiella* species, particularly against Gram-positive bacteria.

While less studied, Aloe vera has shown inhibitory activity against *Candida*, indicating potential antifungal properties. It is even used as a fish tank water conditioner for its antifungal effects.

Aloe vera's antiviral and antitumor activities are believed to be a result of both indirect and direct effects. Indirectly, Aloe vera stimulates the immune system, while direct effects may be attributed to anthraquinones. Clinical trials are ongoing to gather conclusive evidence for the use of Aloe vera in the treatment of HIV-AIDS or cancer.⁽²⁴⁾

Studies conducted on pathogen-free rats have shown promising results for age-related diseases, indicating that Aloe vera may have beneficial effects in this context as well. It's important to note that while Aloe vera has demonstrated various potential health benefits, further research and clinical trials are necessary to fully understand its mechanisms of action and to establish its efficacy and safety for specific conditions.⁽²⁵⁾

The Use of Aloe vera in Animal Nutrition

Indeed, Aloe vera has shown potential benefits in promoting growth and improving the health of chickens. Studies have demonstrated positive effects on production performance and immune function in broiler chickens when their diet was supplemented with Aloe powder, Aloe water extract, Aloe ethanol extract, or a mixture of these extracts. Aloe water extracts have been particularly effective in enhancing body weight in broilers. Similar results have been reported when Aloe vera extract was added to the drinking water of broiler chickens.

However, some studies have not found significant effects on body weight or feed conversion ratio in broilers fed with Aloe vera.⁽²⁶⁾ The dietary supplementation of Aloe vera has also not shown significant impacts on carcass characteristics, sensory attributes of broiler meat, abdominal fat levels, cholesterol levels in breast and thigh muscles, or serum biochemistry.

Aloe vera has shown promise in improving the immune response of broilers, as evidenced by higher haemagglutination inhibition titre values against Newcastle disease. It has also been suggested that Aloe vera can be used to treat and control coccidiosis in chickens, a common poultry disease.⁽²⁷⁾

In laying hens, incorporating Aloe vera in their diet has been found to significantly improve egg production without affecting feed consumption or feed conversion ratio. Additionally, the dietary supplementation of Aloe vera extracts may help prevent or treat the effects of lead intoxication in birds.

Furthermore, Aloe vera has been used as a natural phyto-genic growth promoter in shrimp, yielding promising results in promoting shrimp growth. It's important to note that while these findings suggest potential benefits of Aloe vera in chicken farming,

further research is needed to determine optimal dosage, long-term effects, and potential interactions with other factors in the production system.⁽²⁸⁾

Conclusion

Indeed, aloe vera is a remarkable plant with a wide range of medicinal and cosmetic properties. Its gel contains beneficial compounds that offer numerous benefits to human health and well-being. The plant has been traditionally used to treat various skin ailments, including cuts, insect stings, bruises, poison ivy, and eczema. It is also known for its moisturizing and anti-aging properties, helping to keep the skin hydrated and youthful-looking.

In addition to its effects on the skin, aloe vera has been studied for its potential health benefits when ingested. It is believed to have anti-inflammatory and antiseptic properties, making it useful in relieving symptoms associated with conditions like cancer and diabetes.

Furthermore, aloe vera is commonly used in the cosmetic field due to its various properties and potential benefits.

However, while aloe vera is widely recognized for its potential benefits, further research is needed to fully understand its mechanisms of action and to maximize its utilization for the well-being of humanity. It is important to introduce and explore this plant further to fully appreciate and harness its potential benefits.

It's worth noting that aloe vera is a natural gift from nature, and it is essential to approach its use with gratitude and understanding. It is recommended to perform a patch test and consult with healthcare professionals, especially if you have existing medical conditions or are taking medications, to ensure its safe and appropriate use. Overall, aloe vera is a versatile and valuable plant that continues to be appreciated for its medicinal and cosmetic applications. Its potential benefits for skincare, wound healing, digestive health, and overall well-being make it a cherished natural remedy.

References

1. Marshall JM. Aloe vera gel: What is the evidence? *Pharma Jr.* 1990; 24:360–2.
2. Davis RH. Aloe vera: A scientific approach. New York: Vantage Press;.

3. Aloe. Natural Medicines website. Accessed at naturalmedicines.therapeuticresearch.com on October 14, 2019. [Database subscription].
4. 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.
5. Atherton P. Aloe vera revisited. *Br J Phytother* .1998; 4:76–83.
6. Shelton M. Aloe vera, its chemical and therapeutic properties. *Int J Dermatol.* 1991; 30:679 Atherton P. The essential Aloe vera: The actions and the evidence. 2nd ed 1997.
7. Ro JY, Lee B, Kim JY, Chung Y, Chung MH, Lee SK, et al. Inhibitory mechanism of aloe single component (Alprogen) on mediator release in guinea pig lung mast cells activated with specific antigen-antibody reactions. *J Pharmacol Exp Ther.* 2000; 292:114–21.
8. Hutter JA, Salmon M, Stavinoha WB, Satsangi N, Williams RF, Streep RT, et al. Anti-inflammatory C-glucosylchromone from *Aloe barbadense*. *J Nat Prod.* 1996; 59:541
9. Chithra R Sajith Lal GB, Chandrakasan G. Influence of aloe vera on collagen characteristics in healing dermal wounds in rats. *Mol Cell Biochem.* 1998; 181:71–6.
10. Hegggers J, 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.
11. Chithra P, Sajithlal G, Chandrakasan G. Influence of aloe vera on the glycosaminoglycans in the matrix of healing dermal wounds in rats. *J Ethnopharmacol.* 1998; 59:179.
12. Roberts DB, Travis EL. Ace Mannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice. *Int J Radiat Oncol Biol Phys.* 1995; 32:1047.
13. Sato Y, Ohta S, Shinoda M. Studies on chemical protectors against radiation XXXI:

- Protective effects of *Aloe arborescens* on skin injury induced by x-irradiation. *Yakugaku*
14. Byeon S, Pelley R, Ullrich SE, Waller TA, Bucana CD, Strickland FM. *Aloe barbadensis* extracts reduce the production of interleukin-10 after exposure to ultraviolet radiation. *J Invest Dermatol.* 1988; 110:811–7.
 15. Peng SY, Norman J, Curtin G, Corrier D, McDaniel HR, Busbee D. Decreased mortality of Norman murine sarcoma in mice treated with the immunomodulator, acemannon. *Mol Biother.* 1991; 3:79–87.
 16. Hart LA, Nibbering PH, van den Barselaar MT, van Dijk H, van den Burg AJ, Labadie RP. Effects of low molecular constituents from aloe vera gel on oxidative metabolism and cytotoxic and bactericidal activities of human neutrophils. *Int J Immunopharmacology.* 1990; 12:427.
 17. Ishii Y, Tanizawa H, Takino Y. Studies of aloe. V: Mechanism of cathartic effect. *Biol Pharm Bull.* 1994; 17:651–3.
 18. Sydiskis RJ, Owen DG, Lohr JL, Rosler KH, Blomster RN. Inactivation of enveloped viruses by anthraquinones extracted from plants. *Antimicrob Agents Chemother.* 1991; 35:2463.
 19. Kim HS, Lee BM. Inhibition of benzo [a] pyrene-DNA adduct formation by aloe barbadensis Miller. *Carcinogenesis.* 1997; 18:771–6.
 20. Kim HS, Kacew S, Lee BM. In vitro chemo preventive effects of plant polysaccharides (*Aloe barbadensis* Miller, *Lentinus edodes*, *Ganoderma lucidum*, and *Coriolus*).
 21. 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.
 22. Zawahry ME, Hegazy MR, Helal M. Use of aloe in treating leg ulcers and dermatoses. *Int J Dermatol.* 1973;12:68–73.

Cite this article as:

Mishra G., Ali Z. M., Tiwari H. and Chandrul K. K. (2024). Review on Aloe vera. *Int. J. of Pharm. & Life Sci.*, 15(4): 7-12.

Source of Support: Nil

Conflict of Interest: Not declared

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