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Unlocking the therapeutic potential: A comprehensive review on the medicinal applications of *Aloe vera* DC

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Abstract

Aloe vera, a succulent plant with a rich history in traditional medicine, has garnered widespread attention for its diverse medicinal properties. This comprehensive review delves into the extensive range of therapeutic applications associated with *Aloe vera*. The plant's gel, derived from its fleshy leaves, is a treasure trove of bioactive compounds, including polysaccharides, anthraquinones, and antioxidants. *Aloe vera* has demonstrated anti-inflammatory, antimicrobial, and wound-healing properties, making it a valuable asset in dermatology and skincare. Beyond skin health, this plant has been explored for its potential in managing diabetes, gastrointestinal disorders, and immune system modulation. This review assimilates findings from both traditional knowledge and contemporary scientific research, shedding light on the promising avenues for *Aloe vera* in modern medicine. As we navigate through the intricate web of *Aloe vera*'s medicinal uses, this synthesis aims to provide a comprehensive resource for researchers, healthcare professionals, and enthusiasts interested in the multifaceted applications of this remarkable plant.

Keywords: *Aloe vera*, anti-microbial, anti-inflammatory, wound healing, cardioprotective

Introduction

Aloe vera, a perennial succulent native to arid regions, has transcended its botanical origins to become a revered medicinal plant with a legacy dating back centuries. Revered for its therapeutic potential, *Aloe vera* has played a prominent role in traditional medicine across various cultures. The gel extracted from its fleshy leaves has become a staple ingredient in numerous health and skincare products, attesting to the plant's versatile applications. This review seeks to explore and consolidate the extensive body of knowledge surrounding the medicinal uses of *Aloe vera*. Its historical significance as a healing plant is intertwined with a rich tapestry of cultural practices, from ancient civilizations to contemporary holistic medicine. The gel's composition, comprising polysaccharides, anthraquinones, vitamins, and antioxidants, underscores the plant's biochemical complexity and potential for diverse health benefits. While *Aloe vera* is perhaps most renowned for its dermatological applications, recent scientific investigations have delved into its broader therapeutic spectrum. Anti-inflammatory, antimicrobial, and wound-healing properties have been documented, opening avenues for its utilization in diverse medical fields. Beyond skincare, research has explored *Aloe vera*'s role in managing conditions ranging from diabetes to gastrointestinal disorders, revealing promising prospects for its integration into mainstream healthcare. As we embark on a journey through the medicinal terrain of *Aloe vera*, this review aims to unravel the scientific insights and traditional wisdom that converge on this remarkable plant. By bridging the gap between historical uses and contemporary research, we aim to

provide a comprehensive understanding of *Aloe vera*'s medicinal potential, illuminating its significance in the broader context of natural remedies and modern healthcare practices.

Taxonomic classification

Kingdom: Plantae

Division: Mangnoliophyta (Angiosperms)

Class: Liliopsida (Monocots)

Order: Asparagales

Family: Xanthorrhoeaceae

Genus: *Aloe*

Species: *Vera*

Synonyms: *Aloe berbadensis* miller, *Aloe sepp* R. Br, *Aloeves hadensis* Mill.

Vernacular Names

Language	Name
Bengali	Ghruthakumari
English	Aloes, Indian Aloe, Barbadoe Saleos
Gujarati	Kumarpanj
Hindi	GHeekubour, Gheekavar, Musabbar, Ghee Kanvar
Kannada	Loisera
Malayalam	Kattar Vazha, Chottukattazha, Kattalivazha
Marathi	Khorafeda, Korfan
Sanskrit	Kumari, Khrutha Kumari, Ghirta Kumari
Tamil	Kattazhai, Kattali, Chirukattali
Telugu	Khusamasaram, Chinna Katta Bundha

Plant Description

Aloe vera is a succulent plant known for its various medicinal

and cosmetic properties. Typically, it has thick, fleshy, and lance-shaped leaves that arise from the base in a rosette pattern. The leaves are succulent and filled with a clear gel-like substance. The leaves are usually green, but the shade can vary depending on factors like sunlight and soil conditions. Mature *Aloe vera* plants can reach a height of 24 to 39 inches (60 to 100 cm), with leaves spanning 6 to 19 inches (15 to 50 cm) in length. The edges of the leaves are serrated with small spikes or teeth. The surface of the leaves is smooth and slightly glossy. The inner part of the leaves contains a gel-like substance that is clear and mucilaginous. This gel is widely used for its various health and skincare benefits. *Aloe vera* produces tall flower spikes that can reach up to 35 inches (90 cm) in height. The flowers are tubular and vary in color, often ranging from yellow to orange. This plant is native to North Africa but is now cultivated in various regions around the world. It thrives in arid and semi-arid climates, and well-draining soil is essential for its growth. It is often grown as a potted plant indoors or in gardens with well-draining soil.

Chemical constituents

The phytochemistry of *Aloe vera* refers to the chemical composition of the plant, including its various compounds and constituents. The therapeutic properties of this plant is often attributed to the synergistic interactions of these various bioactive compounds. While it has been traditionally used for its medicinal properties, it's crucial to use *Aloe vera* products from reliable sources and to be aware of potential allergic reactions or sensitivities. It contains a wide array of bioactive compounds, and some of the key phytochemicals found in *Aloe vera* gel and latex include:

- 1. Polysaccharides:** *Aloe vera* gel contains a variety of polysaccharides, such as acemannan. These compounds are believed to contribute to the plant's anti-inflammatory and immune-modulating properties.
- 2. Anthraquinones:** The latex contains anthraquinone glycosides, such as aloin, which has laxative effects. However, the use of whole leaf *Aloe vera* products containing high levels of aloin has raised concerns about potential side effects, and many commercial preparations now remove or reduce the aloin content.
- 3. Enzymes:** The plant contains enzymes such as amylase, lipase, and bradykinase, which may have anti-inflammatory properties and contribute to the plant's ability to break down dead tissue.
- 4. Vitamins:** *Aloe vera* is a source of various vitamins, including vitamin A, vitamin C, vitamin E, and vitamin B complex. These vitamins play essential roles in skin health and overall well-being.
- 5. Minerals:** The plant contains minerals like calcium, magnesium, zinc, and others, which are important for various physiological functions.
- 6. Saponins:** *Aloe vera* contains compounds with soapy characteristics known as saponins. These compounds may have antiseptic and antimicrobial properties.
- 7. Lignins:** Lignins found in this plant may help to enhance the penetrative effect of other bioactive compounds into the skin, which is why it is often used in cosmetic and skincare products.
- 8. Fatty Acids:** *Aloe vera* contains various fatty acids, including salicylic acid, which has anti-inflammatory and

antibacterial properties.

Pharmacological Importance

Aloe vera is a succulent plant that has been widely recognized for its medicinal properties. The gel obtained from its fleshy leaves is a rich source of bioactive compounds, contributing to various therapeutic applications. While it's important to note that the scientific evidence supporting some of these uses is still evolving, here are some reported medicinal uses of *Aloe vera*.

Skin Health

Sunburn Relief: *Aloe vera* is perhaps most well-known for its ability to soothe and moisturize sunburned skin. Applying *Aloe vera* gel to sunburned areas may help alleviate pain and promote healing. (Sahebnaasagh *et al.*, 2017; Tanaka *et al.*, 2016) ^[34, 41].

Wound Healing: The gel's antimicrobial and anti-inflammatory properties may contribute to faster wound healing. It is sometimes used to treat minor cuts, burns, and abrasions. (De Oliveira *et al.*, 2018; Hormozi *et al.*, 2017; Negahdari *et al.*, 2017; Moriyama *et al.*, 2016) ^[11, 15, 29, 27].

Dermatological Conditions

Psoriasis and Eczema: *Aloe vera* may be applied topically to manage symptoms of skin conditions like psoriasis and eczema due to its anti-inflammatory effects. (Liu *et al.*, 2015; Wahedi *et al.*, 2017) ^[23, 46].

Acne Treatment: Some people use *Aloe vera* gel to reduce inflammation and redness associated with acne.

Anti-Inflammatory Effects

Aloe vera contains compounds with anti-inflammatory properties, which may be beneficial for reducing inflammation in various conditions. (Jiang *et al.*, 2018; Ma *et al.*, 2018; Li *et al.*, 2017; Thunyakitpisal *et al.*, 2017; Ahluwalia, 2016; Na H S *et al.*, 2016) ^[18, 25, 22, 42, 1, 28].

Gastrointestinal Health

Digestive Aid: *Aloe vera* latex, a yellowish substance derived from the inner leaf skin, has traditionally been used as a laxative. However, its use for this purpose is controversial, and it should be used cautiously due to potential side effects. (Bala *et al.*, 2018; Park *et al.*, 2017; Avijgan *et al.*, 2016; Werawatganon *et al.*, 2014) ^[7, 31, 6, 47].

Diabetes Management

Some studies suggest that *Aloe vera* may have a role in managing diabetes by helping to regulate blood sugar levels. However, more research is needed to establish its effectiveness and safety for this purpose. (Kim *et al.*, 2018; Noor *et al.*, 2017; Alshatwi and Subash-Babu, 2016; Alinejad *et al.*, 2015; Atiba *et al.*, 2015) ^[21, 30, 3, 2, 5].

Cardioprotective activity

Reports are available regarding the cardioprotective effects of *Aloe vera* extracts. Clinical trials using barbaloin also known as aloin isolated from this plant, when administered intragastrically, reduced myocardial oxidative stress and inflammatory response. An increased AMPK signalling was

also observed in Sprague-Dawley rats in a myocardial ischemia/reperfusion injury (Furkan *et al.*, 2017; Sahin *et al.*, 2017; Zhang *et al.*, 2017; Yuksel *et al.*, 2016; Esmat *et al.*, 2015) [13, 35, 50, 49, 12].

Anti-Cancer Activity

Even though results are available, clinical trials are very limited to confirm the anti-cancer activity of *Aloe vera* and its bioactive principles, it would be informative for future research to focus on this activity based on *in vitro* and *in vivo* studies and their summary results. (Trybus *et al.*, 2018; Shirali *et al.*, 2017; Tseng *et al.*, 2017; Chen *et al.*, 2016; Esmat *et al.*, 2015; Hussain *et al.*, 2015; Luo *et al.*, 2014) [43, 36, 44, 10, 12, 16, 24].

Oral Health

Gum Disease: *Aloe vera* has been explored for its potential in oral health, including the treatment of gingivitis and periodontitis. *Aloe vera*-based mouthwashes or gels may be used for this purpose. (Moghaddam *et al.* 2017; Songsiripraduboon *et al.* 2017; Sholehvar *et al.*, 2016; Vangipuram *et al.*, 2016) [26, 38, 39, 45].

Antioxidant Properties

Aloe vera contains antioxidants that may help neutralize free radicals in the body, potentially contributing to overall health. (Cesar *et al.* 2018; Sun *et al.*, 2017; Prueksrisakul *et al.*, 2015) [9, 40, 32].

Antimicrobial Activity

Several reports are available in connection with anti-microbial activity of different solvent extracts of *Aloe vera* in laboratory experiments (Saddiq and Ghamdi, 2018; Xiang *et al.*, 2017; Arjomandzadegan *et al.*, 2016; Jain *et al.*, 2016; Karkare *et al.*, 2015) [33, 48, 4, 17, 20].

Joint and Muscle Pain

Aloe vera gel may be applied topically to alleviate joint and muscle pain, thanks to its anti-inflammatory properties. (Sun *et al.*, 2017; Singh *et al.*, 2016) [40, 37].

Conclusion

In conclusion, the medicinal uses of *Aloe vera* emerge as a compelling narrative that spans cultural traditions, historical practices, and contemporary scientific investigations. This review has illuminated the multifaceted therapeutic potential of *Aloe vera*, particularly in the context of its gel, which is enriched with bioactive compounds. The wealth of evidence supporting *Aloe vera*'s anti-inflammatory, antimicrobial, and wound-healing properties underscores its significance in dermatological applications. From ancient civilizations to modern skincare formulations, *Aloe vera* has maintained its status as a trusted ally in promoting skin health and treating various dermatological conditions. Moreover, as our understanding of *Aloe vera*'s biochemical composition deepens, its applications extend beyond skincare. The plant's potential role in managing diabetes, gastrointestinal disorders, and immune modulation presents exciting opportunities for further exploration in mainstream medicine. The diverse array of bioactive compounds found in *Aloe vera*, including polysaccharides and antioxidants, contributes to its versatility

and therapeutic efficacy. While acknowledging the promising findings, it is essential to emphasize the importance of continued research to fully unlock the potential of this plant in medicinal contexts. Standardization of extraction processes, dosage guidelines, and rigorous clinical trials will contribute to establishing *Aloe vera* as a reliable and evidence-based component of healthcare. As we navigate the complex landscape of natural remedies, *Aloe vera* emerges as a resilient and promising candidate, offering a botanical reservoir of healing potential that transcends cultural and temporal boundaries. The continued exploration of *Aloe vera*'s medicinal uses holds the promise of not only enhancing skincare regimens but also contributing to a broader spectrum of therapeutic interventions in the realm of modern medicine.

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