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THE UNIVERSAL PANACEA: THERAPEUTIC AND PHARMACOLOGICAL INSIGHTS INTO SIBR (ALOE VERA)

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Abstract

Aloe barbadensis Miller (Aloe vera), a perennial succulent belonging to the family Asphodelaceae, is extensively recognised for its ethnomedicinal and pharmacological significance. Native to North Africa and now widely cultivated across tropical and subtropical regions, Aloe vera has been historically employed for wound healing, gastrointestinal disorders, and systemic rejuvenation. Its therapeutic values have historically served as a versatile remedy documented in classical texts such as *De Materia Medica* and *Al-Qanun fi al-Tibb*. Botanically, the plant is characterised by fleshy, triangular leaves that contain a clear, mucilaginous gel and a bitter, yellow latex, both of which are rich in bioactive compounds, including polysaccharides, anthraquinones, flavonoids, vitamins, enzymes, and minerals. Pharmacological studies have demonstrated its anti-inflammatory, analgesic, anti-arthritic, antioxidant, immunomodulatory, hepatoprotective, diuretic, laxative, and wound-healing activities. Classical Unani literature describes its actions as purgative, emmenagogue, carminative, and nerve-purifying, with applications across various conditions, including gastrointestinal, musculoskeletal, dermatological, and gynaecological disorders. Despite extensive traditional and contemporary research, notable gaps remain in standardisation, mechanistic elucidation, and clinical validation. Therefore, a comprehensive evaluation of Aloe vera's ethnomedicinal, phytochemical, and pharmacological activities is essential. This review synthesises current evidence on aloe vera in oral health care, emphasizing its therapeutic relevance and potential for evidence-based applications.

Keywords: Sibr, Aloe barbedensis, Unani medicine

Introduction

Aloe barbadensis Miller, commonly known as *Aloe vera*, is a perennial, succulent, stoloniferous and xerophytic plant belonging to the family Asphodelaceae (formerly Liliaceae).[1,2] It is believed to have originated in Africa but is now widely distributed across tropical and subtropical regions, including Asia, the Americas, and the Mediterranean[3]. Among more than 400 species of *Aloe*, only a few are recognized for their medicinal importance, with *A. vera* being the most extensively studied and commercially utilised.[4]Traditionally recognized for its medicinal and cosmetic value, Aloe vera has been used in various ancient systems of medicine, including Ayurveda, Unani, and traditional Chinese medicine, primarily for treating burns, wounds, gastrointestinal disorders, and skin diseases.[1]

The name *Aloe vera* derives from the Arabic word **"**Alloeh**,"** meaning *shining bitter substance*, while the Latin term **"**vera**"** means *true*, highlighting the authenticity among *Aloe* species.[5] Throughout history, the plant has been honoured with several epithets, including *"the wand of heaven," "heaven's blessing,"* and *"the silent healer."*[6]Ancient Egyptians revered it as the "plant of immortality"**,** cultivating it as early as 4000 BCE for its rejuvenating and healing properties.[5] Furthermore, Dioscorides, the renowned Greek physician, also documented its pharmacological actions in *De Materia Medica* (41–68 A.D.), thereby providing one of the earliest scientific descriptions of its therapeutic potential. The species has several synonyms: A. barbadensis Mill., Aloe Indica Royle, and Aloe perfoliata L. var. Vera and A. vulgaris Lam, also known by common names such as Chinese aloe, Indian aloe, True aloe, Barbados aloe, and Burn, is a first aid plant.[7]

Botanically, *A. vera* is characterised by long, fleshy, triangular leaves that contain two distinct components: a clear mucilaginous gel obtained from the inner parenchyma and a bitter yellow latex secreted by pericyclic cells beneath the leaf rind. Gheekwar consists of the root /rhizome of it.

The gel is widely utilised for its wound-healing, anti-inflammatory, and immunomodulatory effects, whereas the latex is rich in anthraquinones**,** particularly aloin, known for their potent laxative activity.[8]

Phytochemical analyses have identified a diverse range of bioactive compounds in *A. vera*, including polysaccharides, vitamins, amino acids, phenolic compounds, enzymes, and minerals. Acemannan is considered the main functional component of aloe vera and is composed of a long chain of acetylated. These contribute to its diverse pharmacological activities, such as antioxidant, antimicrobial, hepatoprotective, dermatological, and immunomodulatory properties, etc.[3] Owing to this multifaceted profile, *A. vera* has been extensively applied in pharmaceuticals, nutraceuticals, cosmetics and herbal formulations.

Despite its long history of medicinal use and growing scientific validation, important research gaps remain in understanding its precise mechanisms of action, standardisation of bioactive constituents, and large-scale clinical evaluation. This review aims to provide a comprehensive overview of the ethnomedicinal history, phytochemical properties, pharmacological activities, and highlight its therapeutic applications, research opportunities, and evidence-based utilisation**.**

Table 1:Taxonomic classification of sibr (*Aloe barbedensis Linn.)*[9–13]

Kingdom	Plantae
Sub kingdom	Tracheobionata
Superdivision	*Spermatophyta*
Division	Magnoliophyta
Class	*Liliopsida* - Monocotyledons
Sub class	Rosids/*Liliidae*
Order	Asparagales
Family	Asphodelaceae (Liliaceae)
Genus	Aloe L.
Species	aloevera

(a) (b) (c)

Fig.1: *Sibr* Plant (a) **with fresh(b) & dry pulp (c)**

Table 2: Vernacular names (*Mutradifat*)[2,11–19]	
Unani	*Faiqra*
Ayurvedic	*Kanyaasaara, Eleyaka, Kumaari, Kanyaa, Ghritkumaarika*
Siddha/Tamil	*Mangal, Manjal*
Arabic	*Sibr, Sabbara*[15]
Persian	*Shabyar, Alwa Sibr, Darakhtesinn*[2,14,15]
French	*Aloes*
English	*Indian Aloe, Small Aloe* [12,14]
Urdu	*Musabbar, Aelva, Sibr, Gheekwar*[13,15]
Hindi	*Aelwa,Gheghwar*[15,16]*,Ghikanvar*[12]*, Kumari*[12,14]*Musabbar*[15]
Punj	*Kalasohaga, Mussubar, Alua, Elva*[12]
Gujrati	*Kunvar*[9,12,14]*,Eliyo,Eariy,Kumarnathy*[2] *,kumarpathu* [15,16]
Telugu	*Musambaramu, Chinna- Katabanda* [9,14–16]
Tamil	*kattalai*[12]*,kumari*[12]*,chirukattali* [9,14–16]
Malayalam	*Chenninayakam*[14]*,Kattavaya*[14]*,Kumari*[15,16]*, Kattavala*[12,14]
Marathi	*Korphad*[9,12,15,16]*, Korkand* [14]
Bengali	*Ghritakalmi,Ghrit-Kumari*[12,14]*,Musabbar, Kanya*
Sanskrit	*Kumarai, Aileekh, Kumari, Grikhakanya, Ghritra-kumari* [9,12,14–16]*Sahasara.*

Distribution and cultivation

Aloe vera is native to North Africa, but it has spread widely to the East Indies, India, China, and several other regions.[15]It is now cultivated throughout North and South Tropical America, the Caribbean, and tropical Asia. In India, it grows wild on the coast of Mumbai, Gujarat, and South India.[12,13] Aloe prefers light, sandy, and medium loamy soil that is nutrient-poor but well-drained. It can grow in nonpartisan and basic (alkaline) soil and withstands harsh conditions, including drought. However, it cannot survive in overly wet or shaded areas. As a xerophytic plant, it thrives in dry or slightly moist soil.[20]

Description in Unani Literature

As per the authoritative texts of Unani literature, *Sibr* is described as the dried juice of Aloe barbadensis**.** According to Gilani**,** its nomenclature is attributed to its *Mushil* (purgative) action, since its administration usually causes *ishaal* (diarrhoea) on the following day. In regional terminology, it is called Sabara in Syria and Gheghwar in the Indian subcontinent.[18] The word Ayarij**,** often associated with it, is derived from Unani terminology and denotes a combination of drugs signifying *"Mushil"* or *"Dawae Ilahi"* (divine purgative).

Elva, as described in classical treatises, possesses leaves resembling those of Sosan (Irsa)—thick, fleshy, and broad at the base, somewhat bent backward, with small, thin prickles along the margins. It produces a stalk like *Anthericum*, bears white flowers, and its seeds are similar to those of *Asphodelus*. The plant has a distinct fragrance, an intensely bitter taste, and a single, stake-like root. It is reported to grow abundantly in India, as well as in Arabia, Asia**,** and certain coastal regions and islands such as Andros. This variety, used for external application, rather, the leaf is pounded and applied to *qarh* (ulcers), *zarb* (bruises), and *jurh* (wounds). Its juice is thick and somewhat grainy, occurring in two forms: one of pure extract, and the other resembling liver in appearance.[18]

Unani physicians have recognised three principal varieties of Elva:1) Saqootari Elva, 2) Arabian Elva, and 3) Sanjabi Elva**.** Among these, the Saqootari variety is highly esteemed. Its juice, described as clear light saffron water in appearance, possesses a fragrance akin to bright myrrh**,** is light, clear, and devoid of stony impurities. On the other hand, the Sanjabi type is considered inferior, being putrefactive, overwhelming, light yellow in colour, and lacking in brilliance.[21,22]

Macroscopic Features

The drug typically appears as dark chocolate-brown to black compact masses, generally irregular in shape and hard in consistency. The surface is opaque, dull, and occasionally exhibits a vitreous or resinous sheen. When fractured, the interior appears uneven, brittle, and sometimes shows glassy fragments. It has a distinct, unpleasant odour and imparts a nauseating, intensely bitter taste on mastication.[2,23] In crude form, it may present with a resinous exudate adhering to the surface, and upon prolonged storage, it tends to lose its lustre and becomes more friable and may develop superficial cracks.[14]

Microscopic Features

When the powdered drug is mounted in glycerine or lactophenol and observed under the microscope, it shows numerous crystalline particles. These are yellowish-brown to chocolate in colour and vary in size and shape. In addition, irregular resinous masses, occasional fibrous fragments, and brownish amorphous materials may also be seen. The crystals exhibit a characteristic angular outline, some appearing rectangular or rhomboidal, while others are broken into irregular fragments.[2]The transverse section of the root reveals a central stele encircled by a broad cortex composed of cells rich in contents and crystals. The cortex is enclosed by 3–4 layers of cork cells, while the outermost surface shows an epidermis covered with a cuticle. [19]

IDENTITY, PURITY AND STRENGTH[2]

Identification

I. Mix **0.5 g** of the drug sample with **50 ml** of water, boil gently until almost dissolved, cool, and add **0.5 g of kieselguhr**. Filter the mixture and perform the following tests on the filtrate:

II. Heat 5 ml of the filtrate with 0.2 g of borax until completely dissolved. Add a few drops of this solution to a test tube nearly filled with water. A green fluorescence should appear.

III. Mix 2 ml of the filtrate with 2 ml of a freshly prepared bromine solution. A pale-yellow precipitate should be formed.

Standards of Purity

- **Foreign matter:** Not more than 2%
- **Total ash:** Not more than 5%
- **Acid-insoluble ash:** Not more than 2%
- **Alcohol-soluble extractive:** Not more than 80%
- **Water-soluble extractive:** Not more than 60%
- **Moisture content:** Not more than 10% of its weight when dried to constant weight at **105°C**

Adulteration, Standardisation, and Quality Control of Aloe Vera Products

Adulteration represents a major quality concern in the aloe vera industry, largely due to the high cost of genuine raw materials. To minimise production expenses, some manufacturers dilute or substitute aloe gel powders with low-cost additives. The most common adulterant identified in commercial aloe products is maltodextrin, while other substances such as glucose, glycerine, and malic acid have also been reported.[8,24]Such adulteration significantly affects the therapeutic efficacy of aloe vera by reducing the concentration of **acemannan**, the principal bioactive polysaccharide responsible for many of its pharmacological activities.

To ensure authenticity and maintain therapeutic efficacy, standardisation and quality control are essential. Standardisation involves the establishment of specific parameters to ensure batch-to-batch consistency, including the assessment of physicochemical properties such as pH, total solids, ash content, and polysaccharide concentration. Analytical techniques such as High-Performance Liquid Chromatography (HPLC), Nuclear Magnetic Resonance (NMR) spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), and sugar-acid profiling are widely used to detect adulteration and confirm the authenticity of aloe vera products. These approaches, along with adherence to international quality standards such as those of the World Health Organisation (WHO) for herbal medicines, help ensure the purity, safety, and efficacy of aloe vera formulations.[8,24,25]

Varieties of Aloe vera[9]

- Barbados aloe
- Curaco aloe
- Indian aloe
- Jafrabad aloe

***Hissa Mustʿamil*a (Part used as a drug):**

The dried and fresh juice of the leaves, pulp, and root [12,13,17–19,26]

***Maza* (Taste):**[14,18,19,26,27]

Bitter

***Muzir* (Toxity):**[13,18,26,27]

- It is harmful to the intestine, stomach, and weak hepatic metabolism.
- May cause rectal bleeding due to its erosive purgative action.

***Muslihāt* (Correctives):** [13,17,18,27]

- Masatagi, Afsanteen, Gule surkh
- Kateera, Fuqaa izkhar

***Badal* (Substitutes):**

- Rasoot doubles its weight[21,27]
- Saqmooniya, Afsanteen, Turbud, Zafraan, Maazu[13,17,18,27].

***Mizāj* (Temperament):**

- Hot 2^0 Dry 2^0 [13,17,18,21,26–28]

***Miqdār-e-Khurāk* (Dose):**

- 1-2g, 1-4 g[2,26] Can be given up to 7g, $10^{1/2}$ g [18,27]
- Leaf pulp juice: 10-20 ml; dried leaf pulp juice: 125-500 mg powder.[11,27]

Actions described in the classical Unani literature [2,13,17–19,21,22,26–28]

Aujaa mufassil, Mushil balgham wa safra wa sauda (Purgative), laxativae *Mudirr-i-Bawl (Diuretic), Mudir-i-Haiz* (Emmenagogue), *Mohallil-e-Awaram* (Anti-inflammatory), *Musakkin* (analgesic), *kasir riyah* (carminative), *Mufatteh (deobstruent)*, *Munaqi wa Muqawwi Meda* (Stomachic-tonic), *Mujaffif* (Desiccant), *Qabiz* (Astringent) *Munawwim* (Hypnotic), *Musakhkhin* (calorific), *Jaali* (detergent), *Munaqi aasab (nerve purifier)*

Therapeutic uses according to the Unani classic literature [2,17,18,21,22,26,27]

Waja-ul-Mafasil (Arthritis), *Bawaseer* (Haemorrhoids), *Zoaf-e-Meda* (Gastric weakness), Flactulence, *Inteshare Sha'ar* (Hair fall), *Deedane Ama* (intestinal worms), *Dard-e-Ser* (Headache), Ehtebase Tams (Amenorrhoea), Indemale Q*urooh* (Wound Healing), *Yarqan* (Jaundice), *Malankholia* (Melancholia), *Rabu* (asthma), *Nafsuddam* (Haemoptysis), *Qabz* (constipation), *Shiqaqe Miqad* (Fissure in Ano), eye diseases.

Actions according to ethnobotanical literature [11,12,14]

Laxative, Purgative, Antioxidant, Tonic to stomach and liver, Vermicide, Emmenagogue, Anti-ulcerogenic, Anti-inflammatory, anti-microbial, Anaesthetic, Anti-prostaglandin effect, Anti-spasmodic, Carminative, Diuretic, Blood Purifier, Antileprotic, anthelminthic, cathartic, and cooling.

Uses according to ethnobotanical literature [9,12,14,15,29]

Arthritis, Gout, Tuberculosis, piles, rectal fissures, constipation, menstrual suppression, fever, spleen and liver disease, eye disease, and particularly useful in Lumbago, muscle pain & various inflammatory conditions.

Kimyāwī Ajzā **(Chemical constituents)**[9,15,30–32]

Anthraquinones: Aloe-emodin, aloetic acid, aloin, anthranol, barbaloin, isoberbaloin, emodin, ester of cinnamic acid, Chrysophanic acid., Resistannol.

Sugar: Monosaccharides (glucose and fructose, mannose-6-phosphate), (glucomannans, acetylated glycomannan, acemannan)

Vitamins: B1, B2, B6, C, E, carotene, choline, folic acid, tocopherol

Enzymes: Alkaline phosphatase, bradykinase, Amylase, carboxypeptidase, catalase, cyclooxidase, lipase oxidase.

Inorganic compounds: Calcium, chlorine, chromium, Cu, Fe, Mg, k, p, Na, Zn

Proteins: Lectins, Lectin-like substance

Chromones: 8-C-glusoly-(2'-O-cinnamoly) 7-O-methylaloediol A, 8-C-glucosyl-(S)-aloesol etc.

Amino acids essentials and nonessentials: Alanine, Arginine, Aspartic acid, Glutamic acid, Glycine, Histidine, Phenylalanine, Proline, Threonine, Tyrosine, Valine

Organic acids: Sorbate, salicylic acid, uric acid.

Pharmacological studies

1) **Anti-inflammatory activity:**

   a) A study conducted by Davis and Maro (1989) reported that *Aloe vera* gel and gibberellin significantly inhibited polymorphonuclear leukocyte infiltration at sites of inflammation in streptozotocin-induced diabetic mice, suggesting that gibberellin or gibberellin-like compounds are active anti-inflammatory constituents of *Aloe vera.*[33]

b) A study by Klein (1988) reported that *Aloe vera* contains a **carboxypeptidase** enzyme capable of inactivating bradykinin in vitro. Bradykinin is a peptide that promotes inflammation and vasodilation; thus, its inactivation may contribute to the anti-inflammatory effects of *Aloe vera.*[34]

c) Na et al. (2012) investigated the anti-inflammatory effects of **aloin** in human oral KB epithelial cells stimulated with saliva from healthy volunteers. The study demonstrated that saliva samples with high IL-1β levels induced IL-8 production in KB cells, while pretreatment with aloin significantly suppressed IL-8 expression by inhibiting the p38 MAPK and extracellular signal-regulated kinase (ERK) signalling pathways.[35]

d) Budai et al. (2013) reported that **Aloe vera extracts** exhibit anti-inflammatory activity by suppressing LPS-induced TNF-α and IL-6 production and inhibiting NF-κB and NLRP3 inflammasome activation in human macrophages.[36]

e) Thunyakitpisal et al. (2017) demonstrated that **acemannan,** a bioactive polysaccharide from *Aloe vera*, upregulated IL-6 and IL-8 expression and enhanced NF-κB/DNA binding activity in human gingival fibroblasts through activation of the Toll-like receptor-5(TLR-5) signalling pathway.[37]

2Analgesic Activity:

A study conducted by **Kanyadhara et al. (2014)** demonstrated that the ethanolic extract of *Aloe vera*, containing **flavonoids, anthraquinones, and polysaccharides**, significantly reduced neuropathic pain behaviours in sciatic nerve-ligated rats, suggesting its potential utility for pain management [38]

3) Anti Arthritic Activity:

Davis et al. (1986) reported that **anthraquinones (aloe-emodin, anthracene, and aloin)** from *Aloe vera* demonstrated significant **anti-arthritic activity** by reducing inflammation and joint pain, suggesting their potential use in managing arthritis.[39,40]

4) Antioxidant Activity:

Palaniyappan et al. (2023) reported that Aloe barbadensis Miller leaf extracts demonstrated significant antioxidant activity, attributed to bioactive chemical constituents such as **flavonoids, phenolic compounds,** and **tannins**, as well as **methanolic extracts,** and were identified through GC–MS profiling.[41]

5) Diuretic property:

Mahadeva Rao & Thant Zin (2015) showed that the hydro-alcoholic extract of *Aloe vera* (Lu Hui) at 600 mg/kg significantly increased urine volume and enhanced Na^+, K^+, and Cl^- excretion in rats, confirming its diuretic properties. This diuretic effect is likely mediated by **anthraquinones, polyphenols, flavonoids,** and **terpenoids**, enhancing renal filtration and uric acid elimination.[42]

6) Laxative effects:

A study conducted by **Ashafa et al. (2011)** reported that the ethanolic leaf extract of *Aloe vera*, containing **anthraquinone glycosides such as aloin and aloe-emodin**, significantly improved intestinal motility**,** increased faecal volume**,** and normalised body weight in Wistar rats with loperamide-induced constipation, confirming its **laxative activity.**[43]

7) Immunomodulatory activity:

Zhang and Tizard (1996) investigated the immunomodulatory effects of acemannan, a major carbohydrate fraction from *Aloe vera* gel, on a mouse macrophage cell line. The study found that acemannan significantly enhanced the production of nitric oxide and cytokines such as TNF-α, IL-1, and IL-6, indicating its potential to activate macrophages and modulate immune responses.[4,44,45]

8) Hepatoprotective effect:

- A study by **Cui et al. (2014)** showed that Aloe vera polysaccharides (AVGP) exert hepatoprotective effects that protect against chronic alcohol-induced liver injury by reducing serum aminotransferases, hepatic triglycerides, and lipid accumulation, while enhancing lipolysis, lowering oxidative stress, and suppressing inflammation.[46]
- Research reported that Aloe vera's hepatoprotective effects are mainly due to phytosterols like **lophenol and cycloartanol**, which improve lipid metabolism and reduce liver fat accumulation. It also lowers liver inflammation by modulating pro- and anti-inflammatory cytokines, improving metabolic syndrome outcomes.[3]

9) Wound Healing: Most in vitro studies on skin protection study the ability of Aloe vera and active compounds in wound healing.[47]

A study conducted by **Chithra et al. (1998)** reported that the topical application of **Aloe vera gel**, rich in **acemannan and polysaccharides**, significantly accelerated wound contraction, epithelialization, and collagen synthesis in excision wounds of rats, confirming its significant wound **healing potential**.[44,48]

10) Antidiabetes Property:

Studies on the antidiabetic effects of *Aloe vera* and its role in mitigating diabetes-related complications have been conducted primarily in streptozotocin-induced animal models[47].

- A recent *in vitro* study demonstrated that the antidiabetic mechanism of *Aloe vera* polysaccharides is associated with their ability to inhibit apoptosis and suppress endoplasmic reticulum stress signalling pathways.
  - Rajasekaran et al. (2006) investigated the antidiabetic effect of an ethanolic extract from *Aloe vera* leaf gel in streptozotocin-induced diabetic rats. Oral administration of the extract (300 mg/kg/day for 21 days) significantly reduced fasting blood glucose levels and improved plasma insulin. The study demonstrated that the extract effectively mitigated hyperglycaemia and associated metabolic disturbances, supporting its potential as an antidiabetic agent.[49]

11) Anticancer property

Cheng et al. (2018) showed that aloe-emodin exerted cytotoxic effects on colon (colorectal) cancer cell lines at 10, 20, and 40 μM by inducing apoptosis, increasing reactive oxygen species (ROS) production, elevating cytosolic calcium levels, and upregulating endoplasmic reticulum (ER) stress–associated proteins.[47,50]

12) Bone Protection

In vitro studies on isolated *Aloe vera* compounds have explored their potential protective effects on bone pathogenesis. Aloe-emodin was found to promote chondrogenic differentiation in clonal mouse chondrogenic ATDC5 cells, contributing to bone formation through activation of the BMP-2 and MAPK signalling pathways. Additionally, aloin has shown beneficial effects in conditions such as osteoporosis and osteopenia by inhibiting RANKL-induced osteoclast genesis via suppression of the NF-κB signalling pathway in mouse macrophage RAW 264.7 cells.[47]

13) Cardioprotective Effect

In an *in vitro* haemoglobin model, aloe-emodin (100 μM) exhibited maximum anti-aggregatory activity, as indicated by structural modifications characterised by a reduction in β-sheet content and the emergence of α-helices. Conversely, an *in vivo* study demonstrated that aloe-emodin mitigated hyperlipidemia in male Wistar rats by significantly decreasing total cholesterol and low-density lipoprotein cholesterol levels at doses of 50 and 100 mg/kg over a six-week treatment period.[47]

Important formulations (*Murakkabat*)[2,13,17]

Iyarij Feqra, Iyarij-e- Loghaziya, Habbe sibr, habbe shibyar, habbe tinkar, Habbe Ghafis,Habbe Mudirr,Habbe Muntin akbar, Habbe Sara, Habbe Suranjan, Majoon-e-Antaki, Qurs Tinkar, Zimade Jalinoos, kohle bayaz, habb-e-mudirr.

Conclusion

Aloe barbadensis Miller (Aloe vera) is a widely used medicinal plant valued for its rich phytochemical composition and diverse pharmacological actions, many of which align with descriptions in classical Unani literature. Modern studies confirm its anti-inflammatory, antioxidant, hepatoprotective, immunomodulatory, laxative, and wound-healing properties. However, issues such as adulteration, lack of standardisation, and limited clinical evidence remain major challenges. Strengthening quality control and conducting well-designed clinical studies are essential to validate its therapeutic potential and ensure its effective, evidence-based application in contemporary healthcare.

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