Chapter 45
Aloe vera: Use for Skin Disease

Sachin L. Badole, Pranita P. Bagul, and Farid Menaa

Key Points

- *Aloe vera* has been one of the most important plants used in folk medicine.
- It is traditionally used for wound healing, to relieve itching and swelling, as well as for its anti-inflammatory properties.
- *A. vera* is used in a variety of skin ailments such as mild cuts, insect stings, bruises, poison ivy, and eczema.
- *A. vera* possesses incredible moisturizing properties.

Keywords *Aloe vera* • Skin disease • Aloenin

Introduction

In nature, it may be damaged physically by ultraviolet (UV) irradiation or by insects.

Aloe vera (Fig. 45.1) has been one of the most important plants used in folk medicine. The Egyptians called aloe as the "*plant of immortality*" and included it among the funerary gifts buried with the *pharaohs*. It is indigenous to hot countries and has been used medicinally for over 5,000 years by Egyptian, Indian, Chinese, and European cultures [1]. *A. vera* (*Aloe barbadensis* Miller) is a perennial succulent belonging to the Liliaceae family. It is a cactus-like plant that grows in hot, dry climates. It is cultivated throughout India, wild on coasts of Maharashtra, Gujarat, and South India.

Botanical Description

Synonym: *A. barbadensis* Mill., *A. vera* Tourn. ex Linn., *Aleo indica* Royle, *Aleo littoralis* Koening.
Family: Liliaceae; Agavaceae.
English: Curacao aloe, Barbados aloe, Indian aloe, Jaffarabad aloe.

S.L. Badole, M. Pharm., Ph.D. (Pharmacology) (✉) • P.P. Bagul
Department of Pharmacology, PE Society's Modern College of Pharmacy,
Sector 21, Yamuna Nagar, Nigadi, Pune 411044, Maharashtra, India
e-mail: sachinbadole@rediffmail.com; sachinbadole8880@gmail.com; pranitabagul@gmail.com

F. Menaa, Ph.D.
Joint Departments of Chemistry, Pharmacy and Nanotechnology,
Fluorotronics, Inc., 2453 Cades Way, Bldg C, San Diego, CA, USA
e-mail: fmenaa@yahoo.com

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Fig. 45.1 *Aloe vera* plant

Sanskrit: Ghrit kumari.
Ayurvedic: Kanyaasaara, eleyaka (dried juice of the leaves). kumaari, kumaarikaa, kanyaa, grihkanyaa, ghritkumaarika (plant).
Unani: Gheekwaar, sibr.
Siddha/Tamil: Sotru kattraazhai, kumaari. moosaambaram (dried juice).
Folk: Elwaa, musabbar (dried juice of leaves) [2].

A. vera is a stemless or very short-stemmed plant growing to 80–100 cm tall, spreading by offsets and root sprouts. The leaves are lanceolate, thick and fleshy, green to grey-green with a serrated margin. The flowers are produced on a spike up to 90 cm tall, each flower pendulous, with a yellow tubular corolla 2–3 cm long. The tissue in the center of the aloe leaf contains a gel which yields aloe gel or *A. vera* gel. *A. vera* contains acids, amino acids, enzymes, lectin, lipids, minerals, lactates and salicylates, phenolics, polysaccharides, urea, and vitamins [2].

Application in Skin Disease

A. vera is traditionally used for wound healing, to relieve itching and swelling, as well as for its anti-inflammatory and antibacterial properties. The carboxypeptidase and salicylate components of aloe gel can inhibit bradykinin, a pain-producing agent; C-glycosyl chromone appears to reduce topical inflammation. Aloe gel decreases or inhibits the synthesis of thromboxane, which may accelerate the healing of burns [2].

Aloenin is a major constituent of *Aloe arborescens* Miller which has been utilized in Japan as a folk remedy for burns, insect bites, and skin reaction. In the present study, the effects of aloenin on sebaceous gland size, hair growth, and damaged skin were investigated. Aloenin significantly promoted hair growth in depilated mice but did not affect sebaceous gland function in the hamster ear. Aloenin also had recuperative effects on tape-stripped human skin as determined from parameters such as the shape factor of corneocytes, thick abrasion, nuclear ghosts, and cellular arrangement of corneocytes. Since aloenin is effective in healing damaged skin, it may be useful for the treatment of dermatological conditions in the future [3].

Tolerability of topical *A. vera* extract 0.5% in a hydrophilic cream to cure patients with psoriasis vulgaris. Sixty patients (36 M/24 F) aged 18–50 years (mean 25.6) with slight to moderate chronic

plaque-type psoriasis and Psoriasis Area and Severity Index (PASI) scores between 4.8 and 16.7 (mean 9.3) were enrolled and randomized to two parallel groups. The mean duration of the disease prior to enrollment was 8.5 years (range 1–21). Patients were provided with a precoded 100 g tube, placebo or active (with 0.5% *A. vera* extract), and they self-administered trial medication topically (without occlusion) at home three times daily for 5 consecutive days per week (maximum 4 weeks active treatment). Patients were examined on a weekly basis and those showing a progressive reduction of lesions, desquamation followed by decreased erythema, infiltration, and lowered PASI score were considered healed. The study was scheduled for 16 weeks with 12 months of follow-up on a monthly basis. The treatment was well tolerated by all the patients, with no adverse drug-related symptoms and no dropouts. By the end of the study, the *A. vera* extract cream had cured 25/30 patients (83.3%) compared to the placebo cure rate of 2/30 (6.6%) ($P<0.001$) resulting in significant clearing of the psoriatic plaques (328/396 (82.8%) vs. placebo 28/366 (7.7%), $P<0.001$) and a decreased PASI score to a mean of 2.2. Topically applied *A. vera* extract 0.5% in a hydrophilic cream is more effective than placebo and has not shown toxic or any other objective side effects. Therefore, the regimen can be considered a safe and alternative treatment to cure patients suffering from psoriasis [4].

Anti-inflammation is the first step in the wound healing and this effect of two aloe preparations is believed to play a direct role in facilitating the fast healing. Topical administration of the whole leaf juice preparations, either *A. arborescens* Miller or *Aloe ferox* Miller, inhibits the growth of all bacterial strains tested and are fungitoxic to *Cryptococcus neoformans* only. The obtained inhibition zone might be attributed to the greater susceptibility of *C. neoformans* toward two whole-leaf juice preparations than to the control. *A. ferox* Miller might possibly be more potent in inhibiting *C. neoformans* growth than did *A. arborescens* Miller. Pande et al., 1998, reported that leaf extract of *A. vera* (50 and 100 mg/kg) showed radiomodifying effects on the testes of Swiss albino mice. This extract was nontoxic when injected up to 800 mg/kg and significantly enhanced survival time of the irradiated [5]. Kodym and Bujak revealed that aloin caused the development of stimulating contact dermatitis in skin-allergic patient who received topical application of *A. arborescens* Miller [6].

The moisturizing effects of cosmetic formulations containing different concentrations of lyophilized *A. vera* gel were studied, which showed that only formulations with higher concentrations (0.25% w/w and 0.5% w/w) increased the water content of the stratum corneum after a single application. When the formulations were applied twice daily for a period of 2 weeks, all the formulations (containing concentrations of 0.1% w/w, 0.25% w/w, and 0.5% w/w of *A. vera* gel powder) had the same effect. The transepidermal water loss was not changed by inclusion of the *A. vera* gel in the formulations compared to the vehicle used in the formulations. It was proposed that the *A. vera* gel-containing products improved skin hydration possibly by means of a humectants mechanism [7].

The dermal toxicity was one of the issues associated with the topical application of the whole-leaf juice for wound healing. By applying 2–3 ml of the prepared whole-leaf juice to the intact or damaged skin, no signs of irritant contact were observed. *A. ferox* Miller leaf extract (0.5 ml) was applied to the shaved skin of white New Zealand rabbits. Their results showed that a slight erythema was developed in the damaged tissue in one of the six rabbits and such symptom diminished after 3 days [8]. A case of the side effect associated with *A. ferox* leaf extract was reported, when it was instilled into the eye of white New Zealand rabbits, for the induction of minor changes in the eye. Such changes in the eyes became visible after instillation for 1 h and vanished after 1 day [8].

The anti-inflammatory activity of mannose 6-phosphate is believed to resemble the effects observed for acetylated mannan in aloe gel. Aloe gel reduces inflammation that is induced by agents via promotion of prostaglandin synthesis as well as increased infiltration of leucocytes, but is less effective against inflammation caused by agents that produce allergic reactions. Wound healing is a response to injured tissue that results in the restoration of tissue integrity. It was shown that aloe gel could improve wound healing after topical and systemic administration in several studies, while others claimed no effect or even a delay in wound healing. Conflicting results may be explained by stability of the active ingredients as it was shown that the time of treatment after harvesting was an important factor that

determined activity. Several mechanisms have been proposed for the wound healing effects of aloe gel, which include keeping the wound moist, increase epithelial cell migration, more rapid maturation of collagen, and reduction in inflammation. A 5.5 kDa glycoprotein that was isolated from *A. vera* showed an increase in cell migration and accelerated wound healing in a human keratinocyte monolayer [9].

A. vera leaves are succulent, broad at the base, and pointed at the tips, with spines along the edges. These fat leaves contain the clear healing gel that is 96% water. The healing effect of aloe results from its ability to prevent injury to epithelial tissues and promote healing of injured tissues. *A. vera* is used in a variety of skin ailments such as mild cuts, insect stings, bruises, poison ivy, and eczema. It also has antibacterial and antifungal qualities and increases blood flow to wounded areas. It stimulates fibroblasts, the skin cells responsible for wound healing and the manufacture of collagen, the protein that controls the aging process of the skin and wrinkling. The skin absorbs *A. vera* up to four times faster than water; it appears to help the pores of the skin open and receive the moisture and nutrients of the plant. Due to its soothing and cooling qualities, Maharishi Ayurveda recommended *A. vera* for a number of skin conditions. The leaf gel is applied several times a day for light burns and wounds; for mild sun burn apply the paste on affected areas and wash it off after 15 min. In addition to the skin, other epitheliums in our body include the lining of the gut, the bronchial tubes, and the genital tract, which also benefit from the healing effect of *A. vera*.

Three different solvents such as aqueous, ethanol, and acetone were used to extract the bioactive compounds from the leaves of *A. vera* to screen the antimicrobial activity selected human clinical pathogens by agar diffusion method. The maximum antibacterial activities were observed in acetone extracts, then aqueous extracts, and ethanol extract. Antifungal activity of *A. vera* was analyzed against *Aspergillus flavus* and *Aspergillus niger*. The maximum antifungal activity was observed in acetone extracts compared to the other extracts. *A. vera* plant extract with acetone can be used as antimicrobial agents [10].

A. vera has become so popular among consumers as it possesses incredible moisturizing properties. *A. vera* improves the skin's ability to hydrate itself, aids in the removal of dead skin cells, and has an effective penetrating ability that helps transport healthy substances through the skin. *A. vera* is an ideal ingredient in cosmetic and dermatological products. *A. vera* is best known for its soothing and healing effects on burns and other wounds. *A. vera* when applied to a wound increases both threat of wound closure and the tensile strength of the wound via the proliferation of cells including skin, liver, nerve, and blood cells. *A. vera* has been found to reverse degenerative skin changes by stimulating collagen and elastin synthesis, in essence turning back the clock on the effects aging has on skin. *A. vera* prevents suppression of the skin's immune system. Topical application of the *A. vera* can be made up to 24 h after exposure to ultraviolet light without reducing the degree of prevention regarding immune system suppression. *A. vera* is believed to reduce severe joint and muscle pain associated with arthritis as well as pain related to tendinitis and injuries. When applied directly to the area of pain, *A. vera* penetrates the skin to soothe the pain. *A. vera* promotes a variety of anti-inflammatory responses in the body, reducing swelling from injuries and promoting recovery from infections. Such anti-inflammatory responses not only aid in the relief of pain and discomfort but also enhance the overall wound process [11]. Application of a nonconventional *A. vera* and collagen-based dressing on an ischemic lesion in a patient with systemic arterial pressure and diabetes mellitus showed wound healing effect [12].

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