IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

Pharmacognostic and Pharmacological Review on Aloe Vera

Kishori Shingote[1], Anushka Walkunde[2], Nikita Supe[3], Rahul Waghmare[4], Anjali Gaykhe[5], Aditya Tambe[6], Shubham Gadge[7]
Students, Samarth Institute of Pharmacy, Belhe, Maharashtra, India[1,2,3,4,5,6]
Department of Pharmacology, Samarth Institute of Pharmacy, Belhe, Maharashtra, India[7]

Abstract: *Aloe vera has been traditionally used to treat skin injuries (burns, cuts, insect bites, and eczemas) and digestive problems because its anti-inflammatory, antimicrobial, and wound healing properties. This medicinal plant has been aimed at validating traditional uses and deepening the mechanism of action, identifying the compounds responsible for these activities. The most active compounds are aloe-emodin, aloin, aloesin, emodin, and acemannan. This review provides an overview of current pharmacological studies of active constituents, and its types. Aloe to anti-cancer action, skin and digestive protective activity, and antimicrobial properties. The promising results of these studies in basic research encourage a greater number of clinical trials to test the clinical application of Aloe vera and its main compounds, particularly on bone protection, cancer, and diabetes. In this review, we summarize an update of the pharmacological activities (in vitro, in vivo, and clinical trials) of Aloe vera.*

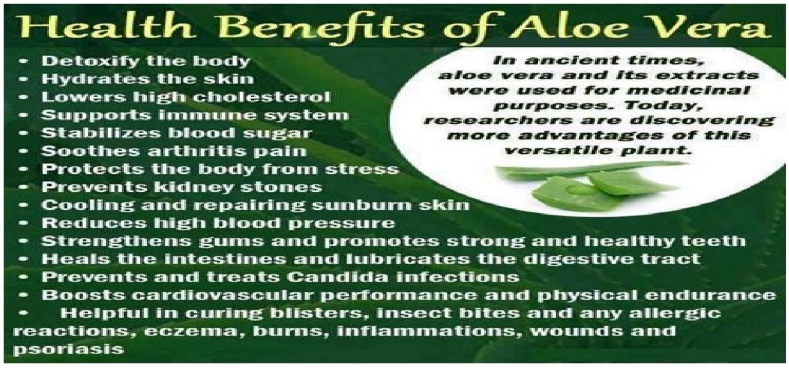
Keywords: Aloe vera extracts, isolated compounds, Pharmacological Activity

I. INTRODUCTION

Aloe vera (Aloe barbadensis Miller, family Xanthorrhoeaceae) is a perennial green herb with bright yellow tubular flowers that is extensively distributed in hot and dry areas of North Africa, the Middle East of Asia, the Southern Mediterranean, and the Canary Islands. Aloe vera derives from “Allaeh” (Arabic word that means “shining bitter substances”) and “Vera” (Latin word that means “true”). The colorless mucilaginous gel from Aloe vera leaves has been extensively used with pharmacological and cosmetic applications. Traditionally, this medicinal plant has been employed to treat skin problems (burns, wounds, and anti-inflammatory processes). Moreover, Aloe vera has shown other therapeutic properties including anticancer, antioxidant, antidiabetic, and antihyperlipidemic.







IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

Aloe vera contains more than 75 different compounds, including vitamins (vitamin A, C, E, and B12), enzymes (i.e., amylase, catalase, and peroxidase), minerals (i.e., zinc, copper, selenium, and calcium), sugars (monosaccharides such as mannose-6-phosphate and polysaccharides such as glucomannans), anthraquinones (aloin and emodin), fatty acids (i.e., lupeol and campesterol), hormones (auxins and gibberellins), and others (i.e., salicylic acid, lignin, and saponins) [1-3].

Classification of *Aloe vera*

Kingdom	**Plantae**
Clade	Angiosperms
Clade	Monocots
Order	Asparagales
Family	Asphodelaceae
Subfamily	Asphodeloideae
Genus	*Aloe*
Species	***A. vera***

Types of Aloe

1. **African aloe (Aloe africana):** Hailing from South Africa, this aloe is single-headed and grows along a vertical trunk with a mass of leaves on top. Drought and cold-temperature tolerant, the African aloe likes full sun and well-drained soil.
2. **Aloe vera (Aloe barbadensis):** Aloe vera, also known as medicinal aloe, is a common houseplant that features rounded, smooth, fleshy leaves that range from pale gray to vibrant green. These plants can generally grow twenty-four to forty inches tall. Aloe vera plant leaves contain a gel with anti-inflammatory compounds.
3. **Cape aloe (Aloe ferox):** Cape aloe, also known as bitter aloe, is a tall, single-stemmed succulent that can grow up to nine feet. This drought-tolerant plant grows best in sandy or grassy dry areas. Cape aloe plants can produce tubular, red and orange flowers. The bitter inner gel has medical uses in traditional cultures, particularly as a laxative.
4. **Climbing aloe (Aloiampelosciliaris):** This aloe plant, formerly known as Aloe ciliaris, features thin leaves and can climb structures and plants. Climbing aloe is fast-growing, and gardeners and hummingbirds favor its eye-catching orange-red flowers.
5. **Coral aloe (Aloe striata):** Coral aloe has broad, flat leaves with gray and reddish edges. The red-orange flowers give this aloe plant its common name. Coral aloe can grow up to two-feet wide, and eighteen inches tall.
6. **Fan aloe (Aloe plicatilis):** This aloe plant gets its name from its unusual, fan-like leaf arrangement. Fan aloe grows best in arid gardens. It is deer resistant and has slender, blue-green foliage and orange flowers.
7. **Gold tooth aloe (Aloe nobilis):** Gold tooth aloe, also known as golden tooth aloe or gold-toothed aloe, is eye-catching with densely packed clusters of rosetipped green leaves. The edges of the leaves feature pale yellow spikes. This plant grows best in full sun and can reach approximately one foot in height, making it great potted succulent.
8. **Lace aloe (Aloe aristata):** This succulent is popular for desert gardens. The dark green leaves feature tiny white bumps, spines, and lacy edges and form in a rosette. Lace aloe pants are small but hardy and can even tolerate near-freezing temperatures. Lace aloe resembles haworthia plants.
9. **Mountain aloe (Aloe marlothii):** This flowering aloe plant thrives in arid conditions and can grow up to ten feet tall. Mountain aloe features a dense crown of spine-covered leaves, and the plant often retains old, desiccated leaves. Mountain aloe blooms in the wintertime, showing off a display of beautiful red and yellow flowers.
10. **Red aloe (Aloe Cameronii):** This evergreen plant has distinct red, narrow, sharp-edged leaves and open rosettes. Red aloe is an adaptive variety of aloe that can grow in hot or cold climates and humid or dry environments.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

11. **Red hot poker aloe (Aloe aculeata):** This variety of aloe is notable for the spines, which originate from the tuberculate base. Red hot poker aloe, also known as ngopanie or sekopecan, can grow up to four feet and bloom in a bright pink mass of flowers at the end of winter

Active Components with its Properties:

Aloe vera contains 8 potentially active constituents:

vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.[4-6]

1. **Vitamins:** It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.

2. **Enzymes**: It contains 8 enzymes: aliiase, alkaline phosphatase, amylase, bradykinase,carboxypeptidase, catalase, cellulase, lipase, and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

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 prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been found. Recently, a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosylchromone, has been isolated from Aloe vera gel.[7-8]

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 4 plant steroids; cholesterol, campesterol, β-sisosterol and lupeol.All these have anti-inflammatory action and lupeol also possesses 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 antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

- **Red aloe (Aloe Cameronii):** This evergreen plant has distinct red, narrow, sharp-edged leaves and open rosettes. Red aloe is an adaptive variety of aloe that can grow in hot or cold climates and humid or dry environments.
- **Red hot poker aloe (Aloe aculeata):** This variety of aloe is notable for the spines, which originate from the tuberculate base. Red hot poker aloe, also known as ngopanie or sekopecan, can grow up to four feet and bloom in a bright pink mass of flowers at the end of winter

Active components with its properties:

Aloe vera contains 8 potentially active constituents:

vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.4-6

1. Vitamins: It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.

2. Enzymes: It contains 8 enzymes: aliiase, alkaline phosphatase, amylase, bradykinase,carboxypeptidase, catalase, cellulase, lipase, and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

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 prominent

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been found. Recently, a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosylchromone, has been isolated from Aloe vera gel.7-8

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 4 plant steroids; cholesterol, campesterol, β-sisosterol and lupeol.All these have anti-inflammatory action and lupeol also possesses 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 antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

Therapeutic action on aloe vera -

1. **Healing properties:** Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral Aloe vera.[9] Aloe gel not only increased collagen content of the wound but also changed collagen composition (more type III) and increased the degree of collagen cross linking. Due to this, it accelerated wound contraction and increased the breaking strength of resulting scar tissue.[10]An increased synthesis of hyaluronic acid and dermatan sulfate in the granulation tissue of a healing wound following oral or topical treatment has been reported.[11]

2. **Effects on skin exposure to UV and gamma radiation:** Aloe vera gel has been reported to have a protective effect against radiation damage to the skin.[12-13] Exact role is not known, but following the administration of aloe vera gel, an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10(IL-10) and hence prevents UV-induced suppression of delayed type hypersensitivity.[14]

3. **Anti-inflammatory action:**Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosylchromone was isolated from gel extracts.[8]

4. **Effects on the immune system:** Alprogen inhibit calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of histamine and leukotriene from mast cells.[7] In a study on mice that had previously been implanted with murine sarcoma cells, acemannan stimulates the synthesis and release of interleukin-1 (IL-1) and tumor necrosis factor from macrophages in mice, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells.[15] Several low-molecular-weight compounds are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils.[16]

5. **Laxative effects:** Anthraquinones present in latex are a potent laxative. It increases intestinal water content, stimulates mucus secretion and increases intestinal peristalsis.[17]

6. **Antiviral and antitumor activity:** These actions may be due to indirect or direct effects. Indirect effect is due to stimulation of the immune system and direct effect is due to anthraquinones. The anthraquinonealoin inactivates various enveloped viruses such as herpes simplex, varicella zoster and influenza.[18] In recent studies, a polysaccharide fraction has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the formation of potentially cancer-initiating benzopyrene-DNA adducts.An induction of glutathione S-transferase and an inhibition of the tumor-promoting effects of phorbolmyristic acetate has also been reported which suggest a possible benefit of using aloe gel in cancer chemoprevention.[19-20]

7. **Moisturizing and anti-aging effect:**Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores. Its moisturizing effects has also

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

been studied in treatment of dry skin associated with occupational exposure where aloe vera gel gloves improved the skin integrity, decreases appearance of fine wrinkle and decreases erythema.[21] It also has anti-acne effect.

8. **Antiseptic effect:**Aloe vera contains 6 antiseptic agents: Lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and viruses.

II. CONCLUSION

This plant is most important & shows Various therapeutic properties. The different parts of plant contains Various Chemical Constituents Shows activity against several disease. A aloe extracts has proved to possess various pharmacalogical properties & potent therapeutic agent A safety profile analysis showed that the Aloe barbadensis is safe in therapeutic doses.It is imperative that more clinical and pharmacological studies should be conduted to investigate the unexploided potential of this plant.

REFERENCES

[1]. Surjushe, A.; Vasani, R.; Saple, D.G. Aloe vera: A short review. Indian J. Dermatol. 2008, 53, 163–166.
[2]. Malik, I.; Zarnigar, H.N. Aloe vera-A Review of its Clinical Effectiveness. Int. Res. J. Phar. 2003, 4, 75–79.
[3]. Maan, A.A.; Nazir, A.; Khan, M.K.I.; Ahmad, T.; Zia, R.; Murid, M.; Abrar, M. The therapeutic properties and Applications of Aloe vera: A review. J. Herb. Med. 2018, 12, 1–10. [CrossRef]
[4]. Atherton P. Aloe vera revisited. *Br J Phytother.*1998;4:76–83. [Google Scholar]
[5]. Shelton M. Aloe vera, its chemical and therapeutic properties. *Int J Dermatol.* 1991;30:679–83.
[6]. 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 PharmacolExpTher.*2000;292:114–21.
[8]. Hutter JA, Salmon M, Stavinoha WB, Satsangi N, Williams RF, Streeper RT, et al. Anti-inflammatory C-glucosylchromone from Aloe barbadensis. *J Nat Prod.*1996;59:541–3.
[9]. Chithra R Sajithlal GB, Chandrakasan G. Influence of aloe vera on collagen characteristics in healing dermal wounds in rats. *Mol Cell Biochem.*1998;181:71–6.
[10]. Heggers 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;59:179–86.
[12]. Roberts DB, Travis EL. Acemannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice. *Int J RadiatOncolBiol Phys.* 1995;32:1047–52.
[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. *YakugakuZasshi.* 1990;110:876–84.
[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 Dermtol.* 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. *MolBiother.*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 molecularbconstituents from aloe vera gel on oxidative metabolism and cytotoxic and bactericidal activities of human neutrophils. *Int J Immunopharmacol.* 1990;12:427–34.
[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;35:2463–6.
[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 chemopreventive effects of plant polysaccharides (Aloe barbadensis

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, October 2022
Impact Factor: 6.252

Miller, Lentinusedodes, Ganodermalucidum, and Coriolusvesicolor) *Carcinogenesis.*1999;20:1637–40.

[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.