

## Review on Therapeutic Uses of Aloe Vera

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**Abstract:** Herbal medicine has been widely used all over the world and formed an integral part of primary health care in many countries including Ethiopia. The use of medicinal plants to treat infections is an old practice in a large part of the world especially in developing countries where there is dependence on traditional medicine to maintain human and animal health. Recognizing this WHO had launched a policy of urging its member states to promote and integrate traditional medicine in to their national health care system. The *Aloe Vera* plant has been known and used for centuries for its health, medicinal and skin care properties. Review about the therapeutic uses of *Aloe Vera* is very important since *Aloe Vera* has various health benefits in humans as well as animals. *Aloe Vera* is a plant with height of almost 60-100 cm containing very short stem or stem-less long leaves and belongs to the family Xanthorrhoeaceae. *Aloe Vera* gel contains a large range of vitamins even vitamin B12, Vitamin A, Vitamin C, Vitamin E and folic acid. *Aloe Vera* gel contains important ingredients including fatty acids and sugars. The *Aloe Vera* as the “Wonder plant” is multiple from being an antiseptic, anti-microbial, anti-ulcer, anti-inflammatory agent, helps in relieving like tumor and diabetes. It is known to help slow down the appearance of wrinkles and actively repair the damaged skin cells that cause the visible signs of aging. *Aloe Vera* has been used externally to treat various skin conditions such as cuts and burns. It is attributed to its minimal side effects, highly effective treatment.

**Key words:** Aloe vera • Medicinal plants • Therapeutic uses

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### INTRODUCTION

Traditional medicine is in practice for many centuries by a substantial proportion of the population of many countries. It is recognized that in some developing countries, plants are the main medicinal source to treat various infectious diseases. Plant extracts represent a continuous effort to find new compound against pathogens. Approximately 20% of the plants found in the world have been submitted to pharmacological test and a substantial number of new antibiotics introduced on the market are obtained from natural or semisynthetic resources [1].

The use of medicinal plants as a source for relief from illness can be traced back over five million years. Only a small percentage has been investigated for pharmacological function [2]. Plants remain the most common source of antimicrobial agents. Their usage as traditional health remedies is most popular all over the world and is reported to have minimal side effects [3]. The plant extracts with known antimicrobial properties can be

of great significance in the treatment of various microbial infections. In the last decade, numerous studies have been conducted in different countries to prove such efficiency in number of medicinal plants [4].

*Aloe Vera* (*Aloe barbadensis* Miller) is a perennial plant of the Xanthorrhoeaceae family [5]. It is also placed by most sources in the Liliaceae family although it has been designated its own family, known as Aloeeaceae [6]. *Aloe vera* has been used for many centuries for its curative and therapeutic properties and although over 75 active ingredients from the innergel have been identified therapeutic effects have not been correlated well with each individual component [7]. *Aloe Vera* is also used as a folk or traditional remedy for a variety of conditions and is found in some dietary supplements and food products. *Aloe vera* gel can be found in hundreds of skin products, including lotions and sun blocks [8].

Many of the medicinal effects of Aloe leaf extracts have been attributed to the polysaccharides found in the inner leaf parenchymatous tissue [9]. However, it is believed that these biological activities should be

assigned to a synergistic action of the compounds contained therein rather than a single chemical substance [10]. *Aloe vera* is the most commercialised aloe species and processing of the leaf pulp has become a large worldwide industry. In the pharmaceutical industry, it has been used for the manufacture of topical products such as ointments and gel preparations, as well as in the production of tablets and capsules [11].

Therefore, the objective of this paper was

- To highlight the therapeutic uses of *Aloe vera* in animals and humans.

**Historical Background of Aloe Vera:** History states that Alexander and Christopher Columbus used *Aloe Vera* for treating wounded soldiers [12]. Cleopatra used it as part of regular beauty regimes. In the history, according to Hannibal states that war have been fought to obtain control over the growing area in North Africa around 1750 BC. It was described how the whole leaf of *Aloe Vera* was used to treat radiation dermatitis in a modern medical paper that was published in 1934. In 20<sup>th</sup> century many papers were published and reports mainly focused on anti-diabetic, anti-microbial and anti-cancer properties of the whole leaf, gel or juice of the plant [13].



Fig. 1: *Aloe vera* in cultivation on Tenerife. Grace et al. [14]

**Botanical Nomenclature and Description of Aloe Vera:**

**Botanical nomenclature of aloe vera:** Botanical name: *Aloe barbadensis*, *Aloe humilis* Blanco, *Aloe induce* Royle [15]. Family: Xanthorrhoeaceae; Genus: Aloe, Species: *Aloe Vera*, Common names: *Aloe Vera*; *Aloe Vera* Linné; True aloe; *Aloe barbadensis* [16].

**Botanical Description of Aloe Vera:** *Aloe Vera* is a perennial, xerophytic, succulent plant with turgid green leaves. It is a stemless or very short-stemmed plant

growing up to 60 to 100 cm tall. It has thick fleshy elongated and pointed leaves that grow to about 30 to 50 cm in length and 10 cm in breadth at the base in the adult plant [17].

**The Leaf Has Three Layers:** The outer layer: is called Rind and has a protective function, synthesizes carbohydrates and proteins. The middle layer: has a yellow sap which is bitter and contains anthraquinones and glycosides. An inner layer: is clear gel and contains 99% water, the rest is made of amino acids, lipids, sterols and vitamins [18]. The vascular bundles located within the leaf pulp, transport, water and minerals from the roots to the leaves; synthesized materials to the roots [9].

The succulent property enables the species to survive in areas of low natural rainfall and other low-water use gardens. The species is hardy, although it is intolerant to very heavy frost or snow. The species is relatively resistant to most insect pests [19].

**Chemical Constituents of Aloe Vera:** Aloe gel consists of sugars, minerals, proteins and lipids. The *Aloe Vera* gel also contains many vitamins including the important antioxidant vitamins [20].

**Vitamins:** *Aloe Vera* contains vitamins A, C and E, which are antioxidants. It also contains vitamin B1, B2 and B12. Antioxidant neutralizes free radicals [12].

**Anthraquinones:** Different types of anthraquinones are present in *Aloe Vera* like: Aloin, Isobarbaloin, Anthracene, Emodin, Barbaloin, Anthranol, Aloetic acid, Aloe Emodin and Resistanol. They act as natural laxatives, painkillers and analgesics and they contain powerful antibacterial, antifungal and virucidal properties [21].

**Minerals:** *Aloe Vera* provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc [12].

**Sugars:** *Aloe Vera* provides monosaccharides (Glucose and fructose) and polysaccharides (Glucomannans/polymannose) [12].

**Fatty Acids:** *Aloe Vera* provides four plant steroids: cholesterol, campesterol and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties [12].

### Health Benefits of Aloe Vera

**Anti-microbial Effects:** *Aloe Vera* inhibits the growth of microorganisms responsible for foodborne illness in humans or animals as well as food spoilage [6].

**Anti-bacterial Effect:** The Aloe extract was potent against strains of *Mycobacterium* and a strong antimycobacterial activity against *Mycobacterium tuberculosis* as well as antibacterial activity against *Pseudomonas aeruginosa*, *E. coli*, *Staphylococcus aureus* and *Salmonella typhi*. *Streptococcus pyogenes* and *Streptococcus faecalis* are two microorganisms that have been inhibited by *Aloe Vera* gel [22].

**Anti-fungal Effect:** The study showed antifungal property as they progressively inhibited the growth of *Malassezia furfur* on Sabouraud's dextrose agar medium. A processed *Aloe Vera* gel preparation inhibited the growth of fungus *Candida albicans* [23]. *Aloe Vera* was found more effective than other species tested [24]. *Aloe Vera* was evaluated on the mycelium development of *Rhizoctonia solani* and *Colletotrichum coccodes* that showed an inhibitory effect of the pulp of *Aloe Vera* reduced the rate of colony growth [25].

**Anti-viral Effect:** many anthraquinones have shown antiviral or virucidal effects on enveloped viruses [26]. Lectins, fractions of *Aloe Vera* gel, directly inhibited the cytomegalovirus proliferation in cell culture, perhaps by interfering with protein synthesis. Aloe emodin is effective against infectivity of herpes simplex virus and it is capable of inactivating all of the viruses, including influenza virus and pseudorabies virus [27].

**Anti-inflammatory Effect:** Inflammation is an innate response of the body against an injury, characterized by swelling, pain, redness and heat, resulting in delay in the healing process. The anti-inflammatory action of *Aloe Vera* gel not only relieves from pain and discomfort, but also accelerates the healing process [28]. The *Aloe Vera* sterol is anti-inflammatory in nature, helps in reducing the inflammation pain and act as natural analgesic. *Aloe Vera* is responsible for anti-inflammatory and anti-microbial properties [29]. *Aloe Vera* gel sterols were able to reduce inflammation by up to 37%. Lupeol, the most active anti-inflammatory sterol, reduced inflammation in a dose dependent manner. The specific plant sterols may also contribute to the anti-inflammatory activity of gel [30].

**Anti-diabetic Effect:** Aloe Vera is a traditional remedy for diabetes mellitus in many parts of the world [31]. Some evidences in humans and animals suggests that Aloe Vera is able to alleviate the chronic hyperglycemia and perturbed lipid profile that are characteristics of diabetes mellitus, which are major risk factors for cardiovascular complications in the disease [32]. It also decreases blood sugar level in hyperglycemic patients. For this purpose, its juice is taken twice daily. Aloe Vera has also been proven effective for use with diabetes which pregnant women are often plagued with; taking Aloe Vera daily can help to prevent gestational diabetes [33].

The treatment of gel extract could restore the decreased plasma levels of high density lipoproteins and increased levels of low density lipoprotein to normal levels. The mechanism behind lowering of blood glucose levels could be enhancement of glucose metabolism or it could also be attributed to the antioxidant effect, which reduces the peroxide levels and hence oxidative damage [34].

**Wound Healing:** *Aloe Vera* is best known for its soothing and healing effects on burn and other wounds. *Aloe Vera* when applied to a wound increases both the rate of wound closure and the tensile strength of the wound via the proliferation of cells [35]. Wound healing is a dynamic process, occurring in three phases. The first phase is inflammation, hyperaemia and leukocyte infiltration. The second phase consists of removal of dead tissue. The third phase of proliferation consists of epithelial regeneration and formation of fibrous tissue [36].

**Anti-tumour Effect:** Glycoproteins present in *Aloe Vera* gel have been reported to have antitumor and antiulcer effects and to increase proliferation of normal human dermal cells [37]. 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 inhibition of the tumor-promoting effects of Phorbol myristic acetate has also been reported which suggest a possible benefit of using Aloe gel in cancer prevention [38].

**Anti-ulcer Effect:** Juice from *Aloe Vera* is very effective for ulcers, heartburn and other digestive disorders. Recent research has identified that *Aloe Vera* may also be used for children [39]. *Aloe Vera* extract inhibits acid secretion which may be due to the presence of lectins in the plant.

It has been shown that lectins inhibit aminopyrine uptake by parietal cells, thus the ability of the extract to inhibit gastric acid output may be as a result of direct action on the acid producing cells [40].

**Moisturizing and Anti-aging Effect:** Aloe has a wonderful moisturizing activity [41]. The presence of mucopoly saccharides help in binding moisture into the skin. It stimulates fibroblast which in turn produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has been shown that the cohesive effects on the superficial flaking epidermal cells by sticking them together, softens the skin. Amino acids also soften hardened skin cells and zinc acts as an astringent to tighten the pores [42]. There are so many products available in the market containing *Aloe Vera* which may be used post-showering to obtain the skin in super soft shape. *Aloe Vera* gel, cream or lotion applied on the face forms a delicious cover that helps to shield the skin from dust and other natural elements which may be injurious to the skin [43].

**Detoxifying Effect:** *Aloe Vera* juice is a great natural aid to detox. With our stressful lives, the pollution around us and the junk foods we eat, we all need to cleanse our systems from time to time. Drinking *Aloe Vera* juice provides a fantastically rich cocktail of vitamins, minerals and trace elements to help our bodies deal with these stresses and strains everyday [44].

**Veterinary Uses of Aloe Vera:** *Aloe Vera* gel is used in veterinary medicine topically to promote wound healing on general skin wounds in all animals. It has also been recommended as a teat-dip in lactating cows, by intramammary administration for treatment of mastitis or high somatic cell counts and by oral route in all food-producing species as adjuvant treatment for a number of afflictions ranging from anaemia to infertility, mastitis and shock [45].

*Aloe* species was the most commonly used herb in rural poultry management as it was used in management of a variety of diseases and *Aloe* acted as broad spectrum remedy in rural poultry health management [46]. As concerns the broiler chickens, the supplementation of their basal diet with *Aloe* powder, or *Aloe* water extract or *Aloe* ethanol extract or an extract mixture of all above, could improve production performance and immune function of male broilers, while the *Aloe* water extracts had better results than the others

[47]. The incorporation of *Aloe Vera* in laying hen diet resulted in a significant improvement in egg production [48].

*Aloe Vera* fed broilers showed significantly higher haemagglutination inhibition titre values against Newcastle disease [49]. In addition extracts of *Aloe* exhibited significant antimicrobial activities against *Salmonella typhi*, *Staphylococcus aureus* and *E. coli* in poultry [50]. *Aloe Vera* can be used to treat and control coccidiosis in chickens [51].

*Aloe Vera* gel is also reported to have antibacterial, antifungal and antimycotic activity *in vitro*. *In vivo* oral administration of *Aloe Vera* gel (Juice) and aqueous whole leaf extract has been reported to lower blood glucose and serum lipid levels (In monkeys) and to be anti-ulcerogenic. Oral administration of *Aloe Vera* gel is also claimed to have anti-arthritis properties. Additional properties are reported for individual constituents of *Aloe Vera* gel. Aloctin A (A lecithin-like substance) has anti-inflammatory properties in rats [45].

**Side Effects of Aloe Vera:** No serious adverse reactions were reported from *Aloe Vera* administration in clinical trials [52]. Hypersensitivity and allergic responses were reported as the most common adverse effects [47].

**Allergy:** The use of *Aloe Vera* preparation should be avoided in individuals with a known allergy to plants of the Liliaceae family, garlic, onions and tulips and soon [53].

**Toxicological Effects During Pregnancy:** The use of *Aloe Vera* as a laxative during pregnancy may pose potential teratogenic and toxicological effects on the embryo and fetus [53].

**Renal or Cardiac Disease:** Prolonged use of *Aloe Vera* latex has been associated with watery diarrhea resulting in electrolyte imbalance and anecdotal reports suggest that the increasing loss of potassium may lead to hypokalemia. Therefore, the *Aloe Vera* latex is contraindicated in patients with a history of renal or cardiac disorders [17].

**Diarrhea or Vomiting:** The topical application of *Aloe Vera* gel resulted in contact dermatitis and oral use may cause diarrhea or vomiting [54]. Many of these reactions appear to be associated with anthraquinone contaminants of the gel product [55].

## CONCLUSIONS

*Aloe Vera* is a medicinal plant that has been used since ages for its diverse therapeutic properties. The chemical composition of *Aloe Vera* is particularly interesting as several of its components have therapeutic and pharmacological properties. *Aloe Vera* can be used as local drug delivery system because of its various benefits including easily applicable with minimal equipment, cheap and less adverse effects. Generally, *Aloe Vera* has many uses both for humans and animals. *Aloe Vera* is being widely used in herbal medicine as antibacterial, antiviral, antifungal and anti-inflammatory agent. It would be worthwhile embarking more scientific investigation on this medicinal plant and to promote its large-scale utilization. Technological developments in the field of analytical chemistry, it has become easier to isolate and characterize the chemical components of the leaf gel and it is expected that more information in this regard will become available in the future at a faster rate.

Therefore, based on the above conclusions the following recommendations are forwarded:

- Further studies are needed to refine the use and improvement of the efficacy of this important medicinal plant.
- Awareness should be created among people who do not have enough information about therapeutic uses of *Aloe Vera*.
- Use of appropriate quantities and qualities of *Aloe Vera* gel and juice should be practiced among society to gain healthy full life.
- Treating animals and human with *Aloe Vera* for most drug resistance disease and complex bacterial disease should be practiced alternatively.

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