

## Components of *Aloe vera*, Therapeutic Uses and Biological Effect in The Human: A Review

Hiba S. Jassim MSc

Dept. of Chemistry and Biochemistry, College of Medicine, Al-Nahrain University, Baghdad, Iraq

### Abstract

The oldest known medicinal plant, *Aloe vera*, is the ideal dietary supplement because it contains high levels of minerals and vitamins. Because of its antibacterial and antifungal properties, *Aloe vera* can also be used to restore the micro flora in the digestive tract, clean the liver and spleen, and strengthen the immune system. As a result, *Aloe vera*, is analgesic, antibacterial, anti-diabetic, and antioxidant characteristics, is utilized widely as a medicinal agent for its therapeutic, immune-regulatory, and neuroprotective effects around the world.

*Aloe* leaves can be broken down into two basic components: the tasteless, colorless gel that is found inside the leaf and the latex a bitter yellow liquid that is located beneath the leaf's epidermis. The parenchymal tissues of the plant's leaves are separated from the gel or juice, which is a transparent, viscous substance. The second component, yellow sap or latex, is an active cathartic medicinal compound known as aloe that is found in the per cyclic tubule cells. They both contain a range of biologically active substances.

*Aloe* is a plant that is used commercially to make pills, sprays, ointments, lotions, liquids, beverages, jellies, and creams.

The purpose of this article was to review the available literature and information on the health benefits of *Aloe vera* and its Products.

**Keywords** *Aloe Vera*, mineral composition, anti-inflammatory, advantages in health, medicinal properties

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**List of abbreviations:** ALV = *Aloe vera*, BC = Before Christ, CR = Congo red

### Introduction

For thousands of years, *Aloe vera* (ALV) has been used in folk medicine for a number of treatments due to its therapeutic properties, particularly when administered topically. According to an Egyptian papyrus, one of the earliest plants known, humans used it for the first time about 3500 BC <sup>(1)</sup>, ALV is a plant that is referred to as the "plant of immortality." The Xanthorrhoeaceae family, which is well-known for its squishy or watery leaves <sup>(2)</sup>.

ALV recommended medical applications are based on both historical and customary usage as well as an examination of current pharmacological and toxicological studies <sup>(3)</sup>.

Phytochemistry of ALV gel has revealed the presence of more than 200 bioactive chemicals. ALV gel is extracted from its leaves and appropriate processing techniques are needed for stabilization as well as preparation of the end products <sup>(4)</sup>.

ALV, a Liliaceous family member <sup>(5,6)</sup> is a perennial succulent known as the miracle/healing plant or the silent healer, with turgid lace-shaped green leaves <sup>(7)</sup>. ALV is a plant that grows to a height of about 60-100

cm and has very little stems or stemless ALV leaves.

Due to ALV abilities of calming, purifying, and supporting the body in maintaining healthy tissues, it has been used since the dawn of time to facilitate the smooth operation of the gastrointestinal tract <sup>(8)</sup>.

Known as proteins or glycoproteins of plant or animal origin, lectins attach to particular sugar moieties on the surfaces of cells and have a variety of intriguing features as tools for biochemistry. Numerous biological and pharmaceutical properties of *Aloe vera*, including immunomodulatory, mitogenic (anti-inflammatory), and burn healing, have been attributed to the lectin <sup>(9)</sup>.

ALV contains 75 potentially active constituents, including Essential amino acids, anthraquinone, minerals, lignins, sugars, salicylic acid and folic acid <sup>(10,11)</sup>.

ALV gel has pH 4.4-4.7, consists primarily of water (98.5%) and polysaccharides vitamins and enzymes, sterols <sup>(10-12)</sup>.

More than 200 bioactive compounds have been found in *Aloe vera* gel via phytochemistry. ALV gel is harvested from the plant's leaves, and the final products must be stabilized and processed using the proper methods <sup>(4)</sup>.

### Properties of *Aloe vera*

Family: Liliaceae

Botanical Name(s): *Aloe barbadensis*, *Aloe indicia*, *Aloe barbados*, ALV <sup>(8)</sup>.

### Biological components

ALV latex and gel contain physiologically active substances with biological effects that can act alone or in combination <sup>(1)</sup>. The bitter, yellow-brown latex, also known as ALV juice, leaf exudate, sap, or aloes, is found in the middle layer and arises from the cells next to the vascular bundles <sup>(9)</sup>. ALV gel is taken from the leaf's innermost core, where parenchymal cells serve as a storage mechanism for water and other nutrients <sup>(5)</sup>, has pH (4.4-4.7) consists primarily of water (98.5%), polysaccharides, enzymes and vitamins <sup>(12)</sup>. The amino acids

included in ALV gel are valine, cysteine, isoleucine, glutamic acid, aspartic acid, glycine, lysine, phenylalanine, serine, arginine and threonine <sup>(13)</sup>.

Based on the shells of *Aloe vera* leaves, it was employed as a novel agricultural adsorbent for the affordable removal of Congo red (CR), a dye that is carcinogenic, from aqueous solutions <sup>(14)</sup>.

Also, aloe juice contains approximately 23 polypeptides, which aid in the control of a wide range of immune system diseases and disorders. Polypeptides, as well as anti-tumor agents Aloe emodin and Aloe lectins, are now used in cancer treatment <sup>(15)</sup>. *Aloe vera* contains 20 to 22 essential amino acids and 7 to 22 necessary amino acids for humans. It includes a wide variety of vitamins, including choline, vitamin B12, vitamin A (beta carotene), B-group vitamins, vitamin C and vitamin E <sup>(2,16,17)</sup> and is available in spray, gel, lotion, capsule, and liquid form <sup>(6)</sup> (Figure 1).

There are three layers in leaves (Figure 2). The outermost layer is a protective layer that is 15 to 20 cells thick and synthesizes carbohydrates and proteins. Aloe's active ingredients, therefore, anti-cancer and anti-inflammatory properties are due to anthraquinones and chromones. The following minerals are found in ALV:

- Minerals as nutritional additive <sup>(9)</sup>.
- Calcium: the concentration of calcium is 558.3 ppm, it is the primary component of bone and aids in controlling the contraction of the skeletal and cardiac muscles, which is necessary for healthy bone and tooth density.
- Copper: Biologically significant enzymes that include copper in their active sites accelerate the oxidation of ferrous iron to ferric iron because this is the fundamental role of copper in the body.
- Magnesium: used by nerves and muscle membranes used to help conduct electrical impulses.
- Potassium: regulates the acidic or alkaline levels of body fluid

## Jassim, *Aloe vera*, Therapeutic Uses

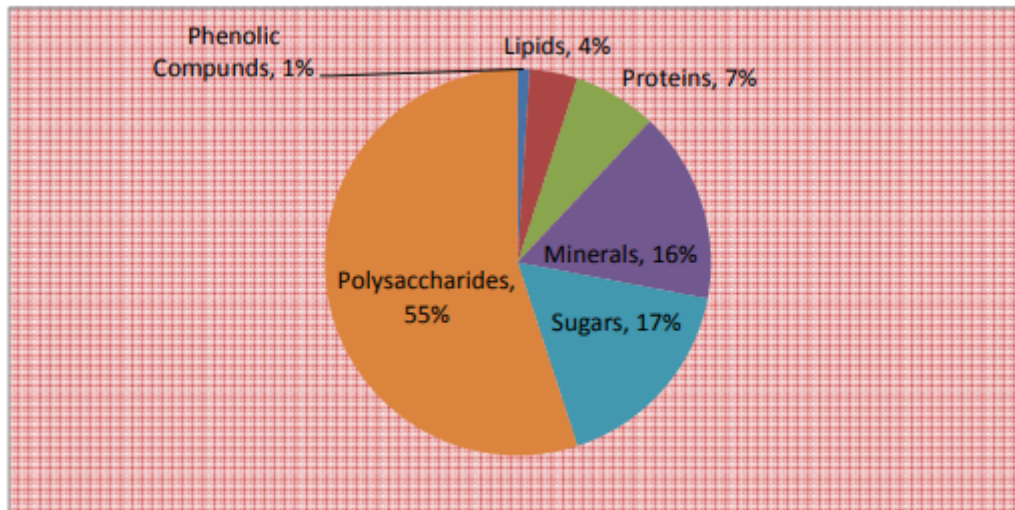


Figure 1. Chemical composition of *Aloe vera* gel <sup>(4)</sup>

- Zinc: contributes to protein, carbohydrate and fat metabolism).
- Chromium: required for the proper function of insulin, which in turn controls blood sugar levels <sup>(9, 18-20)</sup>.

Up to 99% of the water in the leaf gel's deepest layer. Amino acids, lipids, sterols, glucomannans

and vitamins are included in the leaf's interior layers.

In various studies, the bitter yellow latex of the pericyclic tubules in the outer layer of the leaves contains anthraquinone, hydroxyanthracene, and the glycosides aloin A and B in amounts ranging from 15% to 40% <sup>(21)</sup> (Figures 3 and 4).

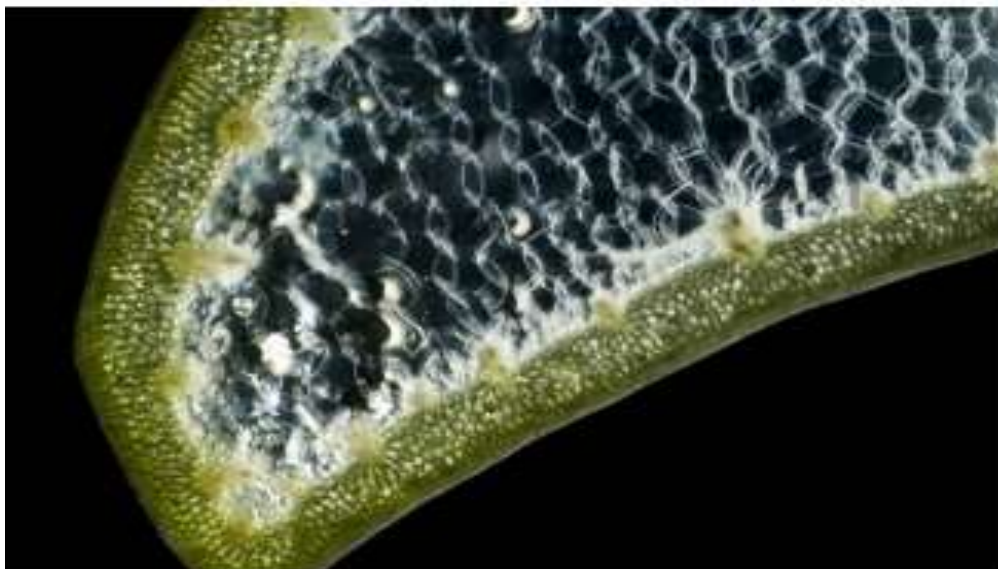


Figure 2. Three cell layers are visible in the leaf's transverse section: a protective layer, a middle layer, and an inner layer, which is colorless <sup>(21)</sup>

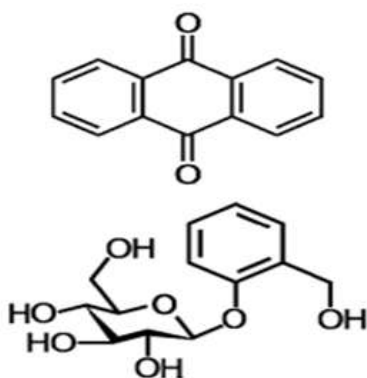


Figure 3. Structure of anthraquinone and structure of glycosides <sup>(21)</sup>

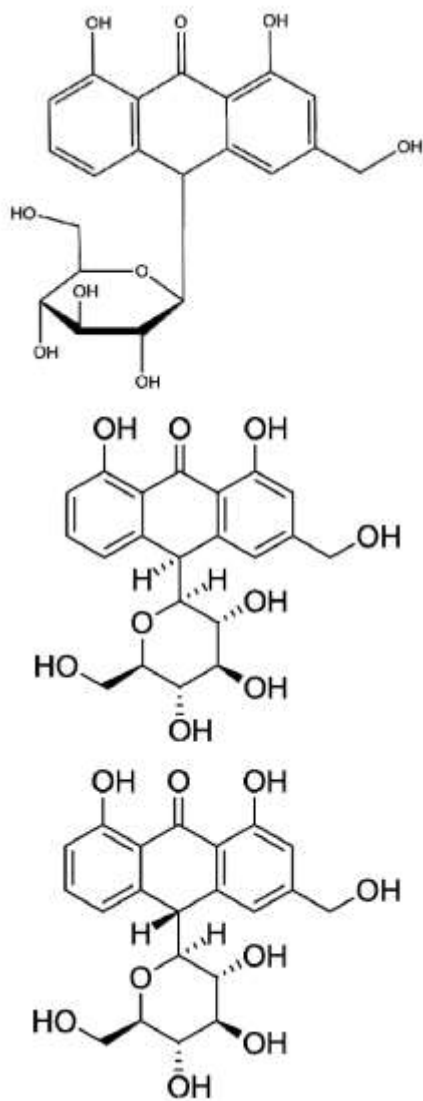


Figure 4. Structure of Aloin, Aloin A, Aloin B <sup>(21)</sup>

**Aloe vera's therapeutic actions**

**1. Anti-diabetic effects of Aloe extract**

Reported on numerous low-dose streptozotocin-induced diabetes in mice, dietary administration of Aloe arborescence Miller components has anti-diabetic benefits. ALV leaf gel extract had positive effects on lipid profile status in rats with streptozotocin diabetes <sup>(22)</sup> (Figure 5).

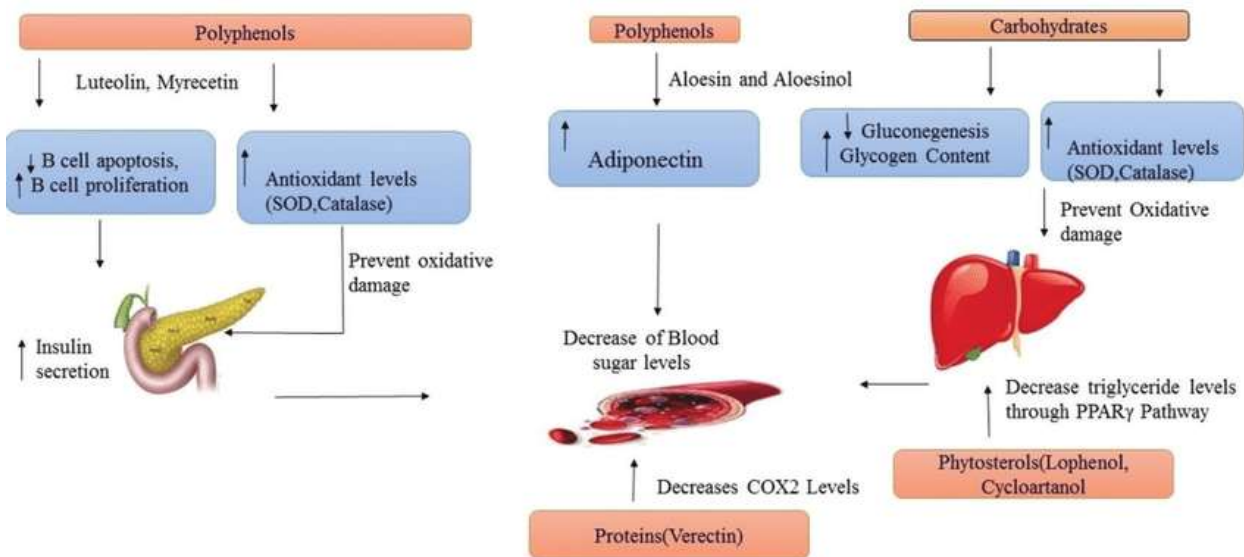
**2. Pharmaceutical industry**

It has been employed in the production of tablets and capsules as well as topical

applications including ointments and gel formulations <sup>(3)</sup>.

**3. Antioxidant activity and antitumor**

The aqueous extract of ALV leaves naturally contains antioxidant components such as total phenols, flavonoids, ascorbic acid, carotene, and tocopherol. There was an increase in hemoglobin and a decrease in blood glucose and glycosylated hemoglobin levels. There is also a significant increase in reduced glutathione, superoxide dismutase, catalase, and glutathione peroxidase <sup>(24)</sup>.



**Figure 5. Aloe vera's mode of action in treating diabetes <sup>(23)</sup>**

**4. Anti-inflammatory agent**

*Aloe vera* decreases the formation of prostaglandin E2 from arachidonic acid by blocking the cyclooxygenase pathway. An innovative anti-inflammatory substance. Recently, a compound named C-glucosyl chromone was also identified from Aloe gel extracts <sup>(22)</sup>. Also, the *aloe vera* juice taken orally may be used to treat inflammation. It may also promote the synthesis of interferon-specific immune active proteins released by blood cells in response to viral infections <sup>(7)</sup>.

**5. Antiviral characteristics**

Numerous scholarly investigations have demonstrated ALV gel is a potent antiviral drug, according to numerous scientific research. Purified aloe emodin has also been shown to be several scientific investigations have shown that ALV gel is a potent antiviral agent effective against inactivated viruses including the influenza virus and chicken pox virus in addition to the infectiousness of herpes simplex types I and II <sup>(10)</sup>.

### 6. Antibacterial properties

Several ALV gel extracts were tested for their antibacterial effectiveness (methanol, ethanol, acetone, hexane, chloroform). The ALV gel exhibits bactericidal activity <sup>(12)</sup> against *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella typhi* in addition to *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, *Streptococcus faecalis*, *Mycobacterium fortuitum*, *Mycobacterium smegmati*, and *Mycobacterium kans* <sup>(10)</sup>. ALV inner-leaf gel inhibited the *Shigella* and *Streptococcus* species in vitro <sup>(25)</sup>.

### 7. Arthritis

Juice from ALV is extremely beneficial with regard to the arthritis patients. Because of the presence of various enzymes, Aloe juice stimulates the immune system. It is a powerful anti-inflammatory agent, analgesic, and has the ability to accelerate cell growth, which allows it to repair arthritis-damaged tissue <sup>(25)</sup>.

### 8. In the management of coronary heart disease and atherosclerosis

One of the main causes of death in the western world is still coronary heart disease, which is brought on by an accumulation of blood fats (Lipids) in the lining of the arteries. Consuming Aloe gel may be advantageous because it lowers serum cholesterol, triglycerides and phospholipids, which seem to speed up the deposition of fatty substances in large and medium-sized arteries, including the coronary arteries of the heart. These studies have involved both human and animal subject, when elevated <sup>(19)</sup>.

### Discussion

The traditional medicines made from plant extracts for medical treatment because they are often effective, generally safe, affordable, and have low side effects <sup>(26)</sup>. Plants must be chosen for their therapeutic potential and safety, and their use must be supported by scientific research in order to be used properly <sup>(27)</sup>. Numerous diseases, including cancer and

coronary heart disease, can be brought on by free radicals. The bioactive components found in many plant extracts, such as phenolic and flavonoids, have effective antioxidant activities and guard against free radical damage. The total phenolic and flavonoid concentrations in ALV leaf gel at various fertilization doses are as a result of the aforementioned factors <sup>(26)</sup>.

Pain is a typical sign of numerous medical conditions that suggests tissue injury. There are many different types of pain including musculoskeletal, migraine, acute pine, chronic pine, surgery pain, neuropathic pain and others. ALV -based therapies have been shown to hasten wound healing, lessen pain intensity in specific health issues compared to comparison groups, and enhance skin pigmentation <sup>(28)</sup>.

The study assessed the nutritional value of aloe leaves and explored if they might be used as edible leaves <sup>(29)</sup>.

### Conclusion

ALV is a promising plant with several biological benefits. Fruits and vegetables coated with ALV had lower superoxide ion, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), superoxide ion (O<sub>2</sub>), ion leakage, and soluble solids content while having higher acidity, anthocyanins, ascorbic acid, catalase (CAT) and superoxide dismutase levels. dismutase levels. (SOD) and ascorbate peroxidase (APX) activities.

Because ALV has the ability to absorb heavy metals and is utilized in polluted soil for treatment, residues of various heavy metals, including aluminum, tin, lead, and arsenic, were also found in the current study.

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E-mail: [haibi.83.89.83@nahrainuniv.edu.iq](mailto:haibi.83.89.83@nahrainuniv.edu.iq)

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