



Chemical Composition, Antioxidants and Phenolic Contents of *Aloe vera*: Using as a Medicinal Purpose against Various Diseases

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Abstract

Aloe barbadensis Mill. is the botanical name of *Aloe vera*, which belongs to the *Liliaceae* family. It is used for medicinal purposes and contains a high range of beneficial nutrients. It is a rich source of carbohydrates, antioxidants and phenolic compounds that work to enhance immunity and prevent various diseases. More than 300 species of *aloe vera* have been reported, of which 4 or 5 are mostly used for medicinal purposes. *Aloe vera* leaf contains 75 different compounds and each has remedial properties. These include lignin, saponins, anthraquinone, various minerals, vitamins amino acids enzymes and sugars. *Aloe vera* is used medicinally to treat several diseases such as wound healing, inflammatory, diabetic, laxative effects and also reduce the risk of cancer and hepatitis. The present review examines the nutritional and medicinal properties of *Aloe vera*.

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Introduction

Aloe vera belongs to the family Liliaceae commonly known as gheegwar/ Ghritkumari. It is very popular as herbal medicine and grows in deserts. It contains 95% water which includes 75 important bioactive compounds, 210 active mixtures, 17 amino acids, 19 minerals, 11 vitamins. It is remarkable by nature in the oldest known medicinal plants and is known by many names. The aloe plant is 20 inches high and 5 inches wide. It has three-cornered thickest leaves. In more than 300 species of *Aloe vera* 4 or 5 are mostly used for medicinal purposes. It is estimated that *Aloe vera* leaf contains 75 different compounds and every one contains remedial properties. These include lignin, saponins, anthraquinone, different minerals, vitamins amino acids enzymes and sugars (Raksha *et al.*, 2014).

The plant of *Aloe vera* has triangular, fleshy leaves with notched ends, yellow tubular flowers and fruits that contain many seeds. Each leaf is made of three layers. An inner whitish gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. The middle layer of fluid which is the harsh yellow sap and include anthraquinone and glycoside. The outer hard part of 15–20 cells called a rind whose function is to protect and synthesizes carbohydrates and proteins. Vascular bundles inside the rind are responsible for carrying substances such as water (xylem) and starch (phloem). There are marvelous medicinal properties in *Aloe vera*. 150 nutritional ingredients in *Aloe vera* has been discovered by scientists. There looks to be no single ingredient responsible for its remarkable properties. They all work together in a combined way to give healing and health-giving benefits (Hamman, 2008).

Aloe vera (*Aloe barbadensis* Mill.) has a place with Liliaceae family conventional being used as a contemporary society cure (Vogler and Ernst, 1999). There are more than 250 types of *Aloe vera* developed far and wide; however, just two classes *A. aborescens* and *A. barbadensis* Miller are viewed as the main significance for handling perspective (Ahmad *et al.*,

2008). A new *Aloe vera* leaves utilized to acquire two parts, firstly severe yellow latex from fringe pack sheath called *Aloe vera* sap and an adhesive gel from parenchymatous tissue. The interest and utilization of gel have expanded significantly in the field of medicinal services and beautification (Devi and Rao, 2005). It is also capable of being used as an important element for nourishment purposes because of its organic exercises and practical qualities (Eshun and He, 2004). *Aloe vera* gel has a severe taste which can be unsavory in crude condition and its acceptability could be improved with the expansion of some other natural product juices.

Aloe vera substances are perceived as germ-killers since they slaughter or control mold, microscopic organisms, growth and infections. It controls a wide range of resistant framework sicknesses and scatters. B-sitosterol is an intense hostile to cholesterol which brings down destructive cholesterol levels, it more valuable for heart patients. *Aloe vera* is very successful in the treatment of smolders, cuts, rub, scraped areas, hypersensitive responses, rheumatoid joint pain, rheumatic fever, corrosive heartburn, ulcers, in addition to numerous incendiary states of the digestive framework and other interior organs, including the stomach, small digestive system, colon, liver, kidney and pancreas (Miranda *et al.*, 2009).

Aloe vera composition

Aloe vera has three auxiliary parts cell walls, worsened organelles and viscous fluid inside the cells. The crude mash of *Aloe vera* has roughly 98.5% and 0.5 to 1 % ash content (Boudreau and Beland, 2006). New *Aloe vera* leaves utilized to get two parts, firstly intense yellow latex from fringe bundle sheath of aloe, called *Aloe vera* sap and an adhesive gel from parenchymatous tissue. The *Aloe vera* plant contains lipids, proteins, amino acids, vitamins, catalysts, inorganic mixes and little natural mixes notwithstanding the diverse sugars (Joseph and Raj 2010). It is also determined that the whole *Aloe vera* has fat, 1.83%; ash, 19.50%; protein, 10.50%; carbohydrate, 56.27%; phosphorous, 1.90 mg/g (Haque *et al.*, 2014). It was evaluated that the

chemical composition of Aloe vera leaves since it has for quite some time been utilized for restorative purposes. The natural arrangement of constituent proximate examination displays moisture, ash, crude protein, crude lipid and crude fiber and ascorbic acid and as well as superoxide dismutase, catalase, peroxidase, amylase, reducing sugars and total soluble sugars. As indicated by a proximate examination in concoction investigation moisture substance of aloe gel contain 97.10, while ash 0.26, and crude fiber were 0.26, ascorbic acid 1.7(mg/100g). Total phenolic contents, total soluble sugar and reducing sugars were also seen in the concentrates (Shubhra *et al.*, 2014). There are 20 different phenolic compounds included cinnamic acid and its derivatives (e.g., chlorogenic acid and caffeic acid), chromones like aloesin and isoaloesin, anthracene and its derivatives like aloin and emorin, many flavonoids like orientin and isovitexin and others. The antioxidant is obtained from peels, roots, gel and flowers of Aloe vera (Quispe *et al.*, 2018).

Carbohydrates

Sugars got from the glue layer of the *Aloe vera*, encompasses the internal gel. Aloe vera has both mono and polysaccharides. *Aloe vera* comprises particularly of the mannose, mono polysaccharides glucose and uronic corrosive. Diverse reports communicating the proximity of glucose and a polyuronide containing a high atomic weight glucose mannose polyose (MW up to around 2.75×10^5) and hexuronic destructive close by indications of galactose, arabinose and xylose. *Aloe vera* gel additionally contains saponins which have purifying and germicide properties (Hamman, 2008).

Aloe vera is famous for its numbers of beneficial characteristics and is generally known as a "medicinal plant". The majority of communal species of *Aloe vera* are *Aloe barbadensis* and *Aloe arborescens*. This semi-tropical plant, Aloe vera, has a long and renowned history courting from holy times. It has been given a high ranking as an all-purpose herbal plant exposed throughout recorded history and. There are two major liquid mechanisms of *Aloe vera* Yellow

latex (exudate) and clear gel (mucilage) are, which ensues to the large leaf parenchymatic cells (Ni *et al.*, 2004).

Vitamins and Minerals

Aloe vera has numerous vitamins including A, B complex, ascorbic acid, E and vitamin D (Chauhan *et al.*, 2011). A few creators additionally proposed the nearness of vitamin B12 (Cyanocobalamin) in follow sum (Rajeswari *et al.*, 2012). Carboxypeptidase inactivates bradykinesia and produces a calming impact. Proteins, for example, corrosive, soluble H_3PO_4 , amylase, lactic dehydrogenase and lipase have likewise been accounted for in the gel. Na, K, Cal and Mg are the prevalent minerals recognized in all leaf portions, in any case, Cal is the primary mineral identified in the skin but Na and K are higher in the gel (Ray *et al.*, 2013).

It was also reported the nearness of Al, Cal, Fe, Mg and Na in *Aloe vera* gel. Investigations of mineral synthesis of *Aloe vera* squeeze found that K and Cl focus seemed, by all accounts, to be over the top for most plant items (Zhang and Tizard, 1996).

Na, K, Cal and Mg are the overwhelming minerals recognized in leafy parts, be that as it may, Cal is the primary mineral identified in the skin and mash while Na and K are higher in the gel. It is also considered that mineral pieces of *Aloe vera* squeeze and reported that potassium and chloride focus seemed, by all accounts, to be intemperate for most plant items (Wang *et al.*, 1998).

Antioxidants

Aloe Vera belongs to a group of a compound which is rich in bioactive compounds displaying health-promoting advantages. It comprises of polyphenols, anthranoids, and derivatives of Pyron, steroids, saponins, salicylic acid, fiber and mineral components (calcium, manganese, potassium, chromium, iron, phosphorus, zinc and natrium), as well as vitamins (C, E, β -carotene, B1, B2, B3, B6, choline, B12, folic acid) (De Rodriguez *et al.*, 2005; Sahu *et al.*, 2013). The concentration of polyphenolic

compounds is somewhat higher in the leaf skin than that of the flower. Catechin is victorious in the skin, while the gentisic acid is concentrated in flower (López *et al.*, 2013).

Owing to the rich chemical composition, along with its antioxidative properties, Aloe vera has become the attention of numerous pharmacological and phytochemical tests which provide very interesting results (Cieślak and Turcza, 2015). It has been demonstrated *Aloe vera* supports the treatment of gastrointestinal canal diseases, such as inflammations, large intestine, stomach and duodenum ulcers. The bioactive compounds in aloe vera act as anti-inflammatorily and deliver the substances being a good medium for symbiotic bacteria. The extract of *Aloe vera* supports the lipids and carbohydrates metabolism which positively affects the cholesterol and blood sugar level along with the right body mass. The external use of *Aloe vera* is wide in the area of skin regeneration (Cieślak and Turcza, 2015).

Several studies have demonstrated that there are the antioxidant, anti-inflammatory and antinociceptive activities in aloe species (Yu *et al.*, 2009). Recent studies have shown that *Aloe vera* leaves have aloemodin and anthraquinone compounds which have the anti-cancer effect (Lin *et al.*, 2010).

According to various studies, the Aloe vera gel and skin have antioxidant effects. *Aloe vera* gel has antioxidant effects due to the compounds present in it included glutathione peroxidase activity, superoxide dismutase enzyme, and phenolic antioxidants. The study performed in two cell-free in vitro systems and incubation with inflamed colorectal mucosal biopsies gives the results that the *A. vera* gel has anti-oxidant effects depending on the dose consumed. The studies with cell-free techniques showed that the scavenging of both superoxide and peroxy radicals occurs in *Aloe vera*. *Aloe vera* gel in the concentration of 1/50th part inhibits the production of prostaglandin E₂ from inflamed colorectal biopsies but there are not any effects of *Aloe vera* gel on thromboxane B₂ release

(Langmead *et al.*, 2004).

Phenolic compounds

There are many health problems or conditions that are cured by the use of *Aloe vera* along with that it is also beneficial for the problems from slight infections to major serious medical conditions. The polyphenols present in plants have been associated with many diverse functional roles, included plant's resistance against many microbial pathogens besides the animal herbivores like insects (antifeeding and antibiotic actions), protection from solar radiations, along with the nutrition, reproduction and growth (Harborne, 2000). The phenolic compounds have been known to prevent many diseases which are the result of oxidative stress (Ferrazzano *et al.*, 2011).

The quantitative and qualitative selection of the phytochemical and analysis of the *Aloe vera* gives the result that phlobatannins, tannin, flavonoids, saponin, terpenoids, steroids and cardiac glycosides anthroquinones are present in it which are used for medicinal purposes (Sathyaprabha *et al.*, 2010). The phenolic compounds are the second most important and major compounds which are present in *Aloe vera*. The main active component present in *Aloe vera* is aloesin which is anthraquinone heteroside by composition (Zanh *et al.*, 2008).

There is a large concentration of phenolic compounds in the different parts of *Aloe vera*. The contents of phenolic compounds are more in the skin of *Aloe vera* leaves than in the flowers. Catechin is present in the Aloe vera leaves appr. (95.0 mg/100g) while genistic acid is present in the flowers (101.0 mg/100 g) (Langmead, 2004). The total phenolic compound's concentration in leaf epidermis and flowers of *Aloe vera* is 307.5mg/100g and that of lyophilized material is 274.5 mg/100g (López *et al.*, 2013).

Clinical properties

Natural exercises of plants have been set up by a vast number of investigations. In light of its interest, it is developed in substantial amounts in numerous parts of the earth. It has various constituents having

potential natural. It has delighted in history as a homegrown cure and is the most prevalent homegrown plant. Real esteem included items from Aloe are gel and squeeze. Plants having a place with sort *Aloe* especially *Aloe vera* has been known for their therapeutic characteristics for a long time. Aloe vera is utilized as hostile to septic, germicidal, blood purifier and in constant ulcers to animate recurring. It is utilized as a part of numerous items, for example, new gel, juice and different definitions of wellbeing, medicinal, toiletries and corrective purposes (Jia *et al.*, 2008; Subramanian *et al.*, 2010).

Polysaccharides and tannins in *Aloe vera* are effective elements for the wound healing. It is also found very helpful for its anti-inflammatory properties due to the glycoprotein and complex polysaccharides. From much researches, it is proved that polysaccharides show physiological and pharmacological effects without coordinating with other elements. The mucilaginous gel of *Aloe vera* is consisting of polysaccharides which hold many secrete to Aloe vera therapeutically activates. In 1935 pain-relieving properties of *Aloe vera* was come to know. Thousands of research papers explain aloe vera health promotion properties either take orally or used externally. *Aloe vera* show five unique characteristics when it is consumed by the body is antiseptic. Aloe vera has a minimum of six antiseptic elements which destroy bacteria, fungi and viruses, penetration: it can reach seven layers deep to the body, cell growth stimulation: its plays an effective role in the stimulation of new body cells and tissues, nerves effect: Aloe vera have effective beneficial nervous system settlement property and cleaning: it helps to remove and detoxify metabolism elements from the body (Sánchez-Machado *et al.*, 2017).

Cleopatra allegedly utilized Aloe for its restorative advantages. Numerous gainful impacts of *Aloe vera* credited to the sugar existence in the mash. The unmistakable mash which is otherwise called gel is broadly utilized as a part of different restorative, corrective, nutritive and therapeutical properties (Ni *et al.*, 2004).

Wound healing effect

It has been noticed that more antioxidative exercises of *Aloe vera* in the skin of the plant. It has been utilized remotely to regard different skin problems, for example, wounds, smolders and dermatitis. These *Aloe* species are as of now recorded in the pharmacopeia of numerous nations in the type of agony *Aloe*, concentrate and powder (Park and Jo, 2006).

For the treatment of incendiary skin issue, wound and burns Aloe vera are used as a folk medicine, widely from the very antiquated history. The clinical investigation concluded that *Aloe vera* contains Vitamin D and mannose-6-phosphate as well as glycoprotein which has cell flourishing ability which is the most effective healing element. Some results show that the healing is done by improving the blood supply through which oxygenation increases in the result wounds healing improves.

The 1930s also comes to know that *Aloe vera* has a protective and healing property against the radiation skin damages and thermal burns. Now a day's Aloe vera is used as a home remedy for skin burns, irritation and moisturizer (Jia *et al.*, 2008).

Anti-inflammatory Effect

After the oral surgery, it may be used for reduces pain because of its anti-inflammatory enzymes bradykinesia and carboxypeptidase which catalyzes the bradykinin, decreases the inflammation and reduce swelling. It is also used for the treatment of ulcers, frostbite and psoriasis (Farzadina *et al.*, 2016).

Anti-diabetic Effect

Aloe vera ethanol consumption help to reduce the blood glucose and lipid profile in diabetic patients. When it takes orally shows more effective results for diabetic patients (Suksomboon *et al.*, 2016).

Laxative effects

From the first century, *Aloe vera* latex is used for its laxative property to relieve constipation as well as

consumed as a purgative. Purgation is done due to its aloin in the gel a crystalline element. For thousands of years, Bitter *Aloe* has been consumed for its purgative characteristics. *Aloe vera* has anthraquinone which has the potential to stimulate the laxation. For the laxation, *Aloe vera* latex increases the water, mucus and intestinal peristalsis in the intestine (Banik and Sharangi, 2016).

Anti-microbial effect

Several scientific types of research show that *Aloe vera* is effective for the development of antibacterial and antifungal substances. *Aloe vera* extracts are utilized in the development of anti-bacterial and anti-fungal chemicals. Numbers of scientists evaluated the antimicrobial and anti-fungal properties of *Aloe vera*. In the 1960s *Aloe vera* tested against several bacteria and found that 90% concentration has the most effective results as compared to 70%. *Aloe vera* has a greater effect as compared to the unpreserved *Aloe vera* for controlling bacterial growth. Due to this antimicrobial and controlling effect, *Aloe vera* has great wound healing properties through which it controls the inflammation. *Aloe vera* has great control to reduce gram-positive bacteria growth (Tippayawat *et al.*, 2016).

Anti-fungal effect

In the 1970s it's come to know that *Aloe vera* leaf powder has great anti-fungal properties due to which it inhibit and control the fungal growth that causes tinea. The antifungal effect has been studied on different fungi like *Trichophyton mentagrophytes*, *Aspergillus niger*, *Cladosporium herbarum* and *Fusarium moniliforme* (Wallis *et al.*, 2016).

Other therapeutic uses

Aloe vera can control tumor development which prolongs the survival of the patient. It is well known all around the world for the treatment from dermatitis to cancer. It has also a well establish importance and reorganization to treat hepatitis. Anti-mutagenic and anti-leukemic activities of the *Aloe vera* have been evaluated in the ethanol *Aloe vera* extract (Wallis *et al.*, 2016).

Conclusion

The study confirms that *Aloe vera* is a rich source of nutrients such as carbohydrates, vitamins and minerals. *Aloe vera* contains antioxidants and phenolic compounds that play an important role in several diseases by increasing immunity. *Aloe vera* leaves naturally contain some medicinal ingredients that are wound healing, anti-diabetic, anti-inflammation, anti-microbial and anti-fungal effects, and prevent cancer and hepatitis.

The laxative ingredients relieve constipation and are effective in colon cells. It was concluded that *Aloe vera* is a therapeutic and nutritional plant.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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