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Aloe Vera Their Chemicals Composition and Applications

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Abstract*: This article provides information on the botanical description, systematics, morphology, importance, chemical composition, application in medicine and folk medicine, as well as medicinal properties of the aloe plant.*

Keywords—Aloerin, Aloein famodin, Anthrax, Skin, Burns, Dermatology, Skin Diseases, Healing Properties

The plant of Aloe vera and its usage as drug dates back to 6000 years B.C. The plates blonging to Sumer period during 2200 years BC, show use of this plant as a drug. In that plates, it is written about origin of this plant as Africa, that has 240 species and is ever green. One prescription that belong to 1550 BC shows Aloe vera plant used for different illness. It was known to people in Egypt and also Greece for example Aristoteles explains special charactristics of Aloe vera. Jelatin that is extracted from this plant is continuously used to treat burns, cuts and inflamed scars since many years. It is also used in cosmetics sector, medical sector and beverage sectors. It is useful for skin damaged from X ray as reported in many researc hes i n journals relate d X rays. Because of high concentration of water and oil in this plant, it helps to protect skin from drieness and so the skin that is burnt or cut heals very quickly. Aloe vera include "Antrokinon" chemicals that are known as anti virus, anti bacteria and anti cancer. Researchers shows that plant is very helpful for treatment of Psoriyazis. Aloe vera is very similar to Cactus but belongs to Lily family of Aloe barbadensis groups. Aloe vera has 400 species but just 2 species; A.barbadensis and A.aborescens are used for trade in the world. This plant need very less water for living and also can survive on saline soils, beaches and is resistance to diseases and insects. It can live in very hot regions, but cannot tolerate cold. Aloe vera grows in South Texas, Florida and South California in USA. It also grows in Mexico, India, South and centeral America, Africa, Australia, Carribians and Iran. The inner leaf lining of the plant is used as a potent natural laxative. In a 1990 survey of members of a health maintenance organization, aloe vera was used by 64%; of these, 91% believed it had been helpful .

Many compounds with diverse structures have been isolated from both the central parenchyma tissue of Aloe vera leaves and the exudate arising from the cells adjacent to the vascular bundles. The bitter yellow exudate contains 1,8 dihydroxyanthraquinone

derivatives and their glycosides, which are mainly used for their cathartic effects. The aloe parenchyma tissue or pulp has been shown to contain proteins, lipids, amino acids, vitamins, enzymes, inorganic compounds and small organic compounds in addition to the different carbohydrates. Some evidence of chemotaxonomic variation in the polysaccharide composition of aloes exists. The large fluctuations in polysaccharide composition of Aloe vera fillet as found in the literature has been explained by the fact that the mannosyl residues are contained in a reserve polysaccharide with a significant seasonal influence, as well as large variations between cultivars in terms of the quantities of mannose-containing polysaccharides within the parenchyma cells. The chemical constituents of *Aloe vera* leaves including the pulp and exudate are given in Table 1.

Summary of the chemical composition of Aloe vera leaf pulp and exudate.

Class	Compounds
Anthraquinones/anthrones	Aloe-emodin, aloetic-acid, anthranol, aloin A and B (or collectively known as barbaloin), isobarbaloin, emodin, ester of cinnamic acid.
Carbohydrates	Pure mannan, acetylated mannan, acetylated glucomannan, glucogalactomannan, galactan, galactogalacturan, arabinogalactan, galactoglucoarabinomannan, pectic substance, xylan, cellulose
Chromones	8-*C*-glucosyl-(2'-*O*-cinnamoyl)-7-*O*-methylaloediol A, 8-*C*-glucosyl-(*S*)-aloesol, 8-*C*-glucosyl-7-*O*-methyl-(*S*)-aloesol, 8-*C*-glucosyl-7-*O*-methyl-aloediol, 8-*C*-glucosyl-noreugenin, isoaloeresin D, isorabaichromone, neoaloesin A
Enzymes	Alkaline phosphatase, amylase, carboxypeptidase, catalase, cyclooxidase, cyclooxygenase, lipase, oxidase, phosphoenolpyruvate carboxylase, superoxide dismutase

Inorganic compounds	Calcium, chlorine, chromium, copper, iron, magnesium, manganese, potassium, phosphorous, sodium, zinc
Miscellaneous including organic compounds and lipids	Arachidonic acid, γ-linolenic acid, steroids (campestrol, cholesterol, β-sitosterol), triglicerides, triterpenoid, gibberillin, lignins, potassium sorbate, salicylic acid, uric acid
Non-essential and essential amino acids	Alanine, arginine, aspartic acid, glutamic acid, glycine, histidine, hydroxyproline, isoleucine, leucine, lysine, methionine, phenylalanine, proline, threonine, tyrosine, valine
Proteins	Lectins, lectin-like substance
Saccharides	Mannose, glucose, *L*-rhamnose, aldopentose
Vitamins	B1, B2, B6, C, β-carotene, choline, folic acid, α-tocopherol

Polysaccharide composition

Polysaccharides make up most of the dry matter of the Aloe vera parenchyma. A storage polysaccharide, acetylated glucomannan, is located within the protoplast of the parenchyma cells and a variety of polysaccharides are present in the cell wall matrix. An overall carbohydrate analysis of the alcohol insoluble residues showed that the cell walls in the fillet of the aloe leaf hold mainly mannose-containing polysaccharides, cellulose and pectic polysaccharides whereas the skin of the leaf contains in addition significant quantities of xylose-containing polysaccharides. Many investigators have identified partially acetylated mannan (or acemannan) as the primary polysaccharide of the gel, while others found pectic substance as the primary polysaccharide. As mentioned before, this discrepancy in polysaccharide composition was initially explained by differences in geographical locations of the plants and seasonal changes but later it was found that extraction and processing of the parenchyma tissue are also very important variables that contribute to the differences in the results. Other polysaccharides such as arabinan, arabinorhamnogalactan, galactan, galactogalacturan, glucogalactomannan, galactoglucoarabinomannan and glucuronic acid-containing polysaccharides have been isolated from the Aloe vera inner leaf gel part.

Effect on gastric acid secretion and ulcers

It has been claimed that Aloe vera gel has the ability to cure gastric ulcers or protect against its formation in both animals and humans. However, it was also shown that aloe gel could not prevent ethanol-induced gastric lesions in rats. The anti-ulcer activities of Aloe vera has been attributed to several possible mechanisms including its anti-inflammatory properties, healing effects, mucus stimulatory effects and regulation of gastric secretions.

Anti-cancer effects

The two fractions from aloes that are claimed to have anti-cancer effects include glycoproteins (lectins) and polysaccharides. The anti-tumour activity of polysaccharides isolated from Aloe vera and specifically acemannan has been investigated in many in vitro models as well as in different animal species. Different studies indicated anti-tumour activity for Aloe vera gel in terms of reduced tumour burden, tumour shrinkage, tumour necrosis and prolonged survival rates. In addition to these effects, Aloe vera gel has also shown chemopreventative and anti-genotoxic effects on benzo[α]pyrene-DNA adducts]. One mechanism of action that was proposed for these anti-cancer effects of aloe polysaccharides is stimulation of the immune response.

Conclusions

Aloe vera has a long history as a medicinal plant with diverse therapeutic applications. Although it was claimed that some of the biological activities of this plant can be attributed to the polysaccharides found in the leaf gel, it is a daunting task to link individual polysaccharides to specific therapeutic properties. Differences in plant composition due to geographic location as well as differences in gel extraction methods and sample preparation techniques have contributed to discrepancies in the results obtained from many studies in terms of the chemical composition and biological activities of Aloe vera leaf gel. Although some indications were found that a particular polysaccharide is effective when tested for a specific biological activity, it seems as if it is rather a combination of compounds that account for the health benefits of Aloe vera leaf gel. With technological developments in the field of analytical chemistry it has become easier to isolate and characterise 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. Interesting pharmaceutical applications such as intestinal absorption enhancement activities and skin penetration improvement effects have recently been shown for Aloe vera gel. The dried gel has also showed potential as an excipient in modified release matrix type tablets. More applications are discovered as research from different view points is conducted on this versatile plant to provide a better understanding of its composition and effects.

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