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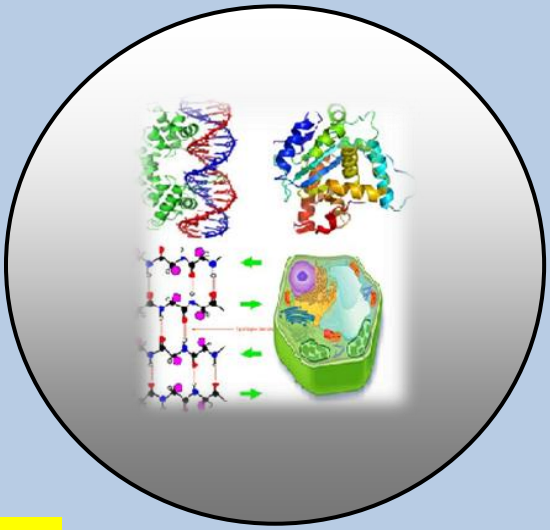

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REVIEW ARTICLE

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Medical Significance of Active Bio Chemicals Isolated from *Aloe vera*

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ABSTRACT

Aloes juice have long been use for a host diseases particularly connected with the digestive system, they have also been used for wound, x-ray burns, skin troubles, trophic ulcer, eye troubles, spleen and liver ailments, dermatitis, cutaneous, leishmaniasis, and other disorder of skin. The plant leaves contains numerous vitamins, minerals, enzymes, amino acids, natural sugars and other bioactive compounds with emollient, purgative, antimicrobial, anti in-flammatory, anti-oxidant, aphrodisiac, anti-helmenthic, antifungal, antiseptic and cosmetic values for health care. The cathartic properties of Aloe vera is to the presences of a mixture of glycosides called 'aloin'. Aloe vera is widely used in food supplements attributed, beverages, pharmaceuticals, and cosmetics.
Keywords: Aloe vera, Aloin, Antimicrobial, Antifungal, Dermatitis and Skin Troubles.

INTRODUCTION

Aloe vera which belongs to the family Liliaceae is a genus (Agav Linn.) of herbaceous, shrubby or arbore scent, perennial, xerophytic and succulents. The botanical name of *Aloe vera* is *Aloe barbadensis mille*r. The plant *Aloe vera* is used in Ayurvedic, Homoeopathic and Allopathic streams of medicine. 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 or biological test, and a substantial number of new antibiotics introduced on the market are obtained from natural or semi synthetic resources. It is a succulent herb of 80 - 100 cm in height which matures in 4 - 6 years and survives for nearly 50 years under favorable conditions. *Aloe vera*, sometimes described as a "wonder plant", is a short-stemmed shrub that only occurs in cultivation – it cannot be found in the wild.

An Aloe is a genus containing more than 500 species of flowering succulent plants. *Aloe barbadensis, Aloe arborescens,* and *Aloe chinensis* are the most popular. *Aloe barbadensisis* considered the most biologically active species. Aloe latex and aloe gel are two products

that can be separated from the plant. *Aloe vera* has marvelous medicinal properties. Scientists have discovered over 150 nutritional ingredients in *Aloe vera*. There seems to be no single magic ingredient. They all work together in a synergistic way to create healing and health giving benefits. The leaf parenchyma (aloe gel) is colorless and tasteless, and has been used particularly in the treatment of skin diseases. This plant has potential to cure sunburns, burns and minor cuts, and even skin cancer. The external use in cosmetic primarily acts as skin healer and prevents injury of epithelial tissues, cures acne and gives a youthful glow to skin, also acts as extremely powerful laxative. The gel consists primarily of water (> 98%) and polysaccharides such as pectin, cellulose, hemicellulose, glucomannan, acemannan and mannose derivatives. *Aloe vera* also contains potentially active constituents, such as vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acid, and amino acids. Due to its therapeutic and functional properties and hence its beneficial effects to humans, the use of *Aloe vera* in the formulation of food products has steadily increased. This plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. Because of high concentration of water and oil in this plant, it helps to protect skin from dryness and so the skin that is burnt or cut heals very quickly. The name *Aloe vera* derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago, the Greek scientists regarded *Aloe vera* as the universal panacea. The Egyptians called Aloe "the plant of immortality." Today, the *Aloe vera* plant has been used for various purposes in dermatology. Innumerable therapeutic agents can be obtained from medicinal plants after screening of secondary metabolite compounds . Of the medicinal plants, Aloes have been used for therapeutic purposes since ancient times. Common names of the plant include Aloe, Aloe capensis, Aloe spicata, *Aloe vera*, Barbados aloe, Cape aloe, Chirukattali (India), Curacao aloe, Ghai Kunwar (India), Ghikumar (India), Indian aloes, Kumari (Sanskrit), Laloi (Haiti), Lohoi (Vietnam), Luhui (Chinese), Nohwa (Korean), Rokai (Japanese), Sabilla (Cuba), Socotrine aloe, Subr (Arabic), Zanzibar aloe.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. It grows in south Texas, Florida, and south California in the USA. It also grows in Mexico, India, South and Central America, Africa, Australia, Caribbean and Iran.

Aloe vera includes "Antrokinon", chemicals that are known as antiviral, antibacterial and anticancer. The principal constituents of aloin is water soluble crystalline glycoside barbaloin [10(1)-deoxy-glucosyl aloe-emodin anthrone, C21H22O9.H20, mp. 148-49°C(anhyd.)]. Among other glycoside constituents reported are isobarbalion and β-barbaloin. Aloes also contain small quantites of free anthraquinones, such as aloe- emodin(hydrolytic product of barbaloin) and isoemodin and resins. Aloe is used in early stages of tuberculosis, dyspepsia, uterine disorders and rectal fissures and as an anthelmintic, cholagigue and emmenagogue. Though the pulp of the leaves is credited with antifertility or abortifacient activity, no antiimplantation activity observed in the antifertility screening test on albino rats, also leaf extract showed very little oxytocic properties of uteri of guineapigs. Aloe used in menstrual diseases and stomach pain, tonic after pregnancy, not prescribed to expectant women. Aloe produces pelvic congestion and used for uterine disorders, generally with iron and carmine. Its root is used in collic pain. Its pulp is used in menstrual suppressions, and its Mucilage is used in painful inflammations.

MATERIAL AND METHODS

The Aloe plant consists of two different parts, each of which produce substances with completely different compositions and therapeutic properties. The parenchymal tissue makes up the inner portion of the aloe leaves and produces the *Aloe vera* gel (or mucilage), a clear, thin, tasteless, jelly-like material. This tissue is recovered from the leaf by separating the gel from the inner cellular debris. The other part of the plant is a group of specialized cells known as the pericyclic tubules, which occur just beneath the outer green rind of the leaf. These cells produce an exudate that consists of a bitter yellow latex with powerful laxative-like actions. The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds. Each leaf is composed of three layers: An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. The middle layer of latex which is the bitter yellow sap and contains anthraquinones and glycosides. The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).The ethanol, methanol and acetone extracts of *Aloe vera* gel were studied for their antimicrobial activity against four Gram-positive and Gram-negative bacteria using agar well diffusion method. The extracts showed varied levels of antimicrobial activity against the tested pathogens. The ethanol and methanol extracts showed higher activity while acetone extract, showed least or no activity against most of the tested pathogens. Fractions obtained from the extracts by Thin Layer and Column Chromatography were studied for their antagonistic properties using Spot Assay Technique. Compounds with maximum antibacterial activity isolated from the ethanol and methanol extracts were identified as p – coumaric acid (Mol. wt.165), ascorbic acid (Mol. wt.177), pyrocatechol (Mol. wt.110) and cinnamic acid (Mol. wt.148), on the basis of Gas Chromatography Mass Spectrometry. The constituents of *Aloe vera* were isolated by various extraction methods such as pressurized hot water extraction, ultrasonic and microwave extraction, supercritical CO2 extraction , and pressurized liquid extraction . Fernand et al. extracted the active components from G alata L. using solid-phase extraction coupled with HPLC analysis. Later Gong et al. used the ionic liquid separation of the *Aloe vera* constituent determined by HPLC method.

RESULTS AND DISCUSSION

Aloes have been used for therapeutic purposes since ancient times. Aloe gel has been very well known for its use in cosmetics as well as in the other areas of medicine such as its property to heal cancer and treat AIDS. *Aloe vera* gel contains powerful antioxidants, which belong to a large family of substances known as polyphenols. *Aloe vera* improved the hypoglycemic effect of glyburide (glibenclamide) when one tablespoonful aloe juice was given orally in the morning and at bedtime to 36 diabetic patients' for42 days. The juice (same dose) showed ant hyperglycemic activity.

It is said to be a natural cleaner, powerful in penetrating tissues, relieving pain associated with joints and muscles, bactericidal, a strong antibiotic, virucidal when in direct contact with long periods, fungicidal and anti-inflammatory.

The antimicrobial agents of *Aloe vera* gel was reported to effectively kill or greatly reduce or eliminate the growth of Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pyogenes, Pseudomonas aeruginosa, Escherichia coli, Propionibacterium acne, Helicobacter pylori and Salmonella typhi.

Anthraquinone glycosides, known as aloin, in small doses act as tonic to the digestive system, and at higher doses become a strong purgative, as well as increase colonic secretions and peristaltic contractions. The skin absorbs *Aloe vera* up to four times faster than water, it appears to help pores of the skin open and receive moisture and nutrients of the plants.

The composition of *Aloe vera* is complex. This plant contains 75 potentially active constituents each of which may have a range of mechanism of actions, acting synergistically or individually to explain more than 200 different constituents notably mucopolysaccharides, enzymes, sugars, lignin, saponins, salicylic acids, sterols, prostaglandins, fatty acids, amino acids and a wide variety of vitamins and minerals. It contains several potentially active bioactive compounds including magnesium lactate, acemannan, lupeol, campestrol, β-sitosterol, aloin A and anthraquinones. Bioactive chemicals isolated from *Aloe vera* and their medicinal properties are:

- 1. Enzymes: "The main enzymes found in *Aloe vera* include Amylase (breaks down sugars and starches), Bradykinase (stimulates immune system, analgesic, anti-inflammatory), Catalase (prevents accumulation of water in the body), Cellulase (aids digestion - cellulose), Lipase (aids digestion - fats), Oxidase, Alkaline Phosphatase, Proteolytiase (hydrolyses proteins into their constituent elements), Creatine Phosphokinase (aids metabolism), and Carboxypeptidase." 2. Anthraquinone: It contains Aloe-emodin which act as analgesics, antibacterial and antivirals, aloectic acid, anthranol, aloin A and B (or collectively known as barbaloin), isobarbaloin, emodin and ester of cinnamic acid (antibacterial). 3. Vitamins: It contains vitamins A (beta-carotene), C and E, which are antioxidants and neutralizes free radicals. It also contains vitamin B1, B2, B6, B12, folic acid, and choline. 4. Non- essential and essential amino acids: The amino acids in *Aloe vera* are the building blocks of protein and influence our brain function. Humans require 22 amino acids and the body will make all of them except for eight essential amino acids which our body gets from the food/drinks that we take in. Every one of the essential amino acids are available in *Aloe vera* and they include isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine, and tryptophan. Some of the other non-essential amino acids found in *Aloe vera* include alanine, arginine, asparagine, cysteine, glutamic acid, glycine, histidine, proline, serine, tyrosine, glutamine, and aspartic acid. 5. Hormones: It contains auxins and gibberellins that helps in wound healing and have anti-inflammatory actions. 6. Inorganic minerals. The Inorganic minerals isolated from *Aloe vera* are Calcium (teeth and bone formation, muscle contractions and heart health), chlorine, chromium(assists with protein metabolism and balancing of blood sugars), copper (important for red blood cells, skin and hair pigment), iron (involved in oxygen transportation and making of hemoglobin in red blood cells), magnesium (strengthens teeth and bones, maintains healthy muscles and nervous system, activates enzymes), manganese, potassium (helps with fluid balance), phosphorous (helps build bones and teeth, assists with metabolism and body pH), sodium (regulates body liquids, helps with nerve and muscle performance, and helps deliver nutrients into body cells) and zinc(necessary for breakdown of proteins).

- A few of these are anti-oxidants that help to boost the immune system and combat free radicals in the body. They are also essential for the proper functioning of various enzymes in different metabolic pathway. *Aloe vera* also contains the trace minerals of rhodium and iridium used in cancer and tumor research experiments. 7. Steroids: There are lupeol, campesterol, cholesterol and β-sitosterol.There have anti-inflammatory properties, lupeol is antiseptic and analgesic. 8. Sugars: *Aloe vera* provides both monosaccharides such as glucose, fructose and polysaccharides which includes pure mannan, acetylated mannan(Acetylated mannan is considered the main functional component of *Aloe vera*, is composed of a long chain of acetylated mannose. This complex carbohydrate accelerates wound healing and reduces radiation induced skin reactions), acetylated glucomannan, glucogalactomannan, galatan, galactogalacturan, arabinogalactan, galactoglucoarabinomannan, pectic substance, xylan, cellulose, chromones, isoaloeresin-D, isoarabaichromone and neoaloesin A. 9. Hormones: Harmones isolated from *Aloe vera* are auxins and gibbererellins that help in wound healing and have anti-inflammatory action. Another constituent of *Aloe vera* includes saponins and lignins. Saponins are soapy substances from the gel that is capable of cleansing and having antiseptic properties. The saponins perform strongly as anti-microbial against bacteria, viruses, fungi, and yeasts. Lignin, an inert substance, when included in topical preparartions, enhances penetrative effect of other ingredients into skin. Lignins penetrate the toughened areas of the skin being beneficial for skin problems such as eczema and psoriasis. *Aloe vera* also contains salicylic acid which is an aspirin-like compound that possesses anti -inflammatory, analgesic, and anti-bacterial properties.

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