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AN OVERVIEW ON MEDICINAL PROPERTIES OF *ALOE VERA*: ANTIBACTERIAL & ANTIFUNGAL ASPECTS

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ABSTRACT

Aloe Vera is attracting the attention of scientists, researchers, and people around the world once again. Because of the multiple uses of *Aloe Vera*, and the easy growth and maintenance of the plant, many researchers of public and private sector have gained interest in this plant. Many novel and effective uses of *Aloe Vera* have come in light due to the researches on *Aloe Vera* in the field of biology, biochemistry and clinical studies. The beneficial effectiveness of *Aloe* in wound healing and being an anti-inflammatory is due to some constituents of *Aloe* that are involved in the healing process. According to the recent studies, the presence of mannose-6-phosphate, the important sugar in the *Aloe* gel, is mainly responsible for the wound healing properties of *Aloe Vera*, and thus considered its possibility of being an active growth substance. Scientist found an innovative and interesting usage of *Aloe Vera* gel as an edible coating on fruits and vegetables that act as the healthy preservative coating and thus will preserve the quality and safety of fruits during cold storage. This study was done on papaya that resulted in its subsequent increase in shelf life. The gel also offers protection from some of the dangerous pathogens by inhibiting their growth, and it also provides numerous health benefits. It is because of this reasons, *Aloe* products are so popular in the market and are widely used in skin care, cosmetics, medical, health care and food industry.

KEYWORDS: ***Aloe Vera*, Epithelization, Contact dermatitis, Edible coating, Bradykinins, Candidiasis.**

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INTRODUCTION

Aloe Vera, an herb, commonly referred to as the "medicinal plant", is known for its wide range of therapeutic properties. It has been used by human species for over 4000 years and because of its usefulness, it is known by different names across the globe. *Aloe Vera* is known as the universal panacea by the Greek scientist 2000 years ago, while the plant of immortality was the name given to *Aloe* by the Egyptians[47]. The name of *Aloe Vera* is originated basically from Arabic and Latin Language. 'Alloeh' is the Arabic word which means 'shining bitter substance' from that *Aloe* word is generated, while 'Vera' is derived from the Latin meaning true[5]. *Aloe Vera* has found many applications in health, cosmetics and medicinal sector. More than 200 species of *Aloe* are present today that belongs to the lily family of botanicals. The most common species are *Aloe barbadensis* Miller and *Aloe arborescens*.Historically, the *Aloe Vera* first originated in Africa, where it's native moved it to other parts of the world which then finally arrived to North America by the Spanish conquistadors. *Aloe Vera* has been used for various purposes in several different cultures across the globe: Greece, Egypt, India, China, Mexico, Japan, Africa and America[33]. The famous Egyptian Queen, Nefertiti and Cleopatra were known to use *Aloe Vera* as in their regular beauty baths. Due to its wound healing properties, it was used by Alexander the Great and Christopher Columbus to treat their soldier's wound. During early 1800's in America, until a turning point occurred by mid-1930s where it became successful for the treatment of variety of chronic and server radiation dermatitis likes diseases[4]. The commercial production of *Aloe Vera* was started in the United States of America in middle of the 20th century. It then became very popular for both Internal and external uses.

CHARACTERSTICS

The botanical name of *Aloe Vera* is *Aloe barbadensis* Miller and it belongs to lily family. The other members of this family such as Onions, turnips and garlic are related to Aloe. Typically, *Aloe* is from Asphodelaceae (*Liliaceae*) family, and is succulent plant. *Aloe Vera* can grow in areas like tropics or subtropics, but they are also capable of growing in arid region due to their water retaining capacity, because of which they can store water in leaves, stems and root and can survive in extreme temperature ranging from 104 ºF to below freezing temperature. It is grown mainly in the dry regions of Africa, Asia, Europe and America. In India it is grown in Rajasthan, Gujarat, Andhra Pradesh, Maharashtra, Tamil Nadu etc.

Active components with its properties

Aloe Vera is a plant made up of many complex ingredients including polysaccharides, glycoproteins, phenolic compounds, salicylic acid, lignins, hormones, amino acids, vitamins, saponins and enzymes which give *Aloe Vera* its many beneficial properties[8-9].

Table[42] 1
Constituents of Aloe Vera and their Activity

Constituents	Number Identified	Activity
Amino Acids	Twenty amino acids required by humans have been found, including 7 of the 8 essential ones, which the body cannot synthesize.	Component of proteins that are required for the functional proteins, such as muscle tissues, enzymes, hormones etc.
Anthraquinones	*Aloe Vera* provides 12 Anthraquinones, including *Aloe* emodin, aloetic acid, aloin, anthracine, anthranon, barbaloin, Chrysophanic acid, emodin, ethereal oil, ester of cinnemonic acid, isobarbaloin, and	In small quantities, anthraquinones act as potent antimicrobial and antiviral agents. In high concentration, these compounds exert a powerful purgative effect. Topically they can absorb ultraviolet light, inhibit tyrronase

	resistannol.	activity, and reduce the formation of melanin.
Enzymes	There are 8 Enzymes isolated from *Aloe Vera*, including aliiase, alkaline phosphatase, amylase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase.	Most of the enzymes help in the break-down of food-sugars and fats. Some of the enzymes may be involved in other functions, such as carboxypeptidase, inactivates bradykinins, and produces anti-inflammatory effect.
Hormones	Two Hormones are known from *Aloe Vera*, which are auxins and gibberellins.	Both of these play an important role in wound-healing and anti-inflammatory effect.
Lignin	Cellulose-based substance.	This woody substance provides penetrating power in *Aloe Vera* skin-penetrations, so having the ability to carry other active ingredients deep into the skin to nourish the dermis.
Minerals	*Aloe Vera* provides 9 minerals: Calcium, Chromium, Copper, Iron, Magnesium, Manganese, Potassium, Sodium and Zinc.	These are essential for good health and known to work in certain combination with each other, vitamins and other trace-elements. Magnesium lactate inhibits histidine decarboxylase and prevents the formation of histamine from amino acid, histadine. Histamine is released in many allergic conditions and causes intense itching and pain.
Salicylic Acid	Aspirin-like compound.	Acts as analgesic.
Saponins	Glycosides	These soapy substances form 3% of the gel and are general cleansers, having antiseptic properties.
Sterols	The plant provides 4 main plant-steroids: Cholesterol, Campesterol, Lupeol, Beta Sitosterol.	Sterols are anti-inflammatory agents, whereas Lupeol also possesses antiseptic and analgesic properties.
Sugars	*Aloe Vera* provides both monosaccharide, (glucose and fructose) and polysaccharides (Glucomannans and polymanose).	Monosaccharides have anti inflammatory action and polysaccharides possess antiviral, immune-modulating activity such as Acemannan.
Vitamins	*Aloe Vera* contains many vitamins, except vitamin D. The vitamins found include vitamins A, C, E, B (the thiamine, Niacin, Riboflavin, B12), F, Choline and Folic acid.	Vitamin B's and Choline are involved in amino-acid metabolism, B12 plays an important role in production of RBCs, and Folic acid is involved in the development of red cells.

ANTIBACTERIAL AND ANTIFUNGAL PROPERTIES OF ALOE VERA

Many novel and effective uses of *Aloe Vera* have come in light due to the researches on *Aloe Vera* in the field of biology, biochemistry and clinical studies. These studies revealed several new antibacterial and antifungal properties of *Aloe Vera* which proved to be beneficial for the mankind. This report presents some of the properties of *Aloe Vera*.

ANTIBACTERIAL PROPERTIES WOUND HEALING

Wound when occurs are more susceptible to exterior infections and other complications, leading to delay in wound healing[26]. Delay in wound healing are also caused by other sources such as diseases like diabetes, immunocomprised conditions, local anemia and conditions like malnourishment, ageing, local infections, and local tissue damage. About 50-75% of the hospital deaths are the result of infection[34].The agents that cause contamination at wound site occur from three main sources- the environment, the surrounding skin and endogenous sources[14]. Wound healing through the series of events, repairs the damaged tissue by maintaining its integrity. Three stages are mainly responsible for wound healing namely inflammatory stage, proliferative stage and remodeling stage. During the starting days, the area surrounding the wound returns to its normal state by controlling bleeding from the expanded blood vessels, by shrinking them. This is an inflammatory stage, clotting and then granulation occurs, where production of collagen, elastin and proteoglycans occur at the wound site by fibroblast. The migration of fibroblast towards wound site and their proliferation is caused by platelets. All these

activities and movements produce the forces for tissue contraction within the matrix region. Then comes, the remodeling stage, during which the tissue in the wound site changes its shape and strength, and thus the formation of new collagen takes place[50]. *Aloe Vera*, when used have the ability to enhance the healing process and is capable of treating minor injuries such as cuts and burns (including sunburns) and ulceration. During one study, it was found that the anti-microbial are responsible for slowing down the wound healing process. But when *Aloe Vera* was applied in combination with an antimicrobial, then the *Aloe Vera* have shown to neutralize the effect of antimicrobial and thus improving the healing process. According to the studies, the glycoprotein fraction of the plant is mainly responsible for the beneficial properties of *Aloe Vera* of wound healing. This effect of glycoprotein was demonstrated in one experiment, in which about 5.5 KDa glycoprotein was isolated from *Aloe Vera*, which was when applied on wound site in human keratinocyte monolayer, showed enhanced cell migration and accelerated wound healing[22]. This effect was also confirmed in hairless mice. The composition of *Aloe Vera* includes several active substances such as enzymes, growth factors, glycoproteins, vitamins and minerals. Accelerated formation of granulation tissue and enhanced epithelization was observed in burn wounds that indicate improvement in healing by using *Aloe Vera*[52]. Most cells store polypeptide hormones like substances known as growth factors, which are secreted into local tissues and thus facilitating the wound cells to communicate with each other. The fibroblast in the wound is act as the cell surface receptor, to which growth factor has been attached. These activities generate the biological response of wound healing. According to the studies, it was found that interaction of growth factors with their receptors is necessary for initiating and thus producing the effects of these growth factors biologically[24]. It was determined that mannose containing products play an important role in promoting wound healing by increasing the macrophage activity[51]. Enhanced macrophage activity leads to increasing cell and tissue growth, activity and proliferation of fibroblast. Thus for proper wound healing, macrophages activity are required[21]. *Aloe Vera* comprises mannose-6-phosphate that binds to cell surface receptors of fibroblast and may activate collagen production directly or indirectly thereby helps in promoting wound healing[11]. According to one report, the mannose-6-phosphate works in a possible manner in wound healing process. According to him, the two ligands i.e. mannose-6-phosphate and insulin like growth factor II attached to the same receptors on the fibroblast and activates hit to enhance the wound healing process[53]. Recent studies strongly support that for proper wound healing to take place or for an anti-inflammatory response, the mannose-6-phosphate should be linked to a polypeptide that may helps in inflammation reduction or promote wound healing. It was observed that in the granulation tissue, the protein content is increased, that may be formed by fibroblast in order to form more fibroblast or for secretion or both.

ANTI-INFLAMMATORY EFFECT

The reaction of the body on the tissues after injury is called inflammation, which is followed by burns or other skin problems. Symptoms include pain, redness, heat, and sometimes swelling in the form of tumor, and in many cases loss of function[30]. Inflammation can either be evoke, enhanced or worsen by attack of micro organism. In some wound cases, inflammation is responsible for the generation of conditions such as arthritis. During the inflammatory process, bradykinins, this is a peptide that causes blood vessels to dilate (vasodilation) and thus produces pain. But the hydrolysis of the peptide produces an analgesic effect. *Aloe Vera* comprises certain enzymes such as lipase, amylase, and of most important carboxypeptidase, which is a metalloenzyme and are also known as Zn proteases as they are dependent on Zinc for their catalytic activity. It generates an anti-inflammatory effect by inactivating bradykinins[39, 45]. The sap of the *Aloe* leaf contains an anthraquinone derivative, known as *Aloe*, which has been used by humans as laxatives for many centuries[17, 28].

The *Aloe* is composed of free anthraquinones and their derivatives such as Barbaloin-IO-*Aloe* emodin-9-anthrone, Isobarbaloin, Anthrone-C-glycosides and chromones, which act as antimicrobial agents and have strong laxative and analgesic effects[29, 48]. The antimicrobial activities of *Aloe Vera* strongly depend on the dose of anthraquinones. According to the studies, *Aloe Vera* is effective against certain skin infections like acne herpes and scapies, as it possess antimicrobial activity against these[23, 31]. *Aloe Vera* contains an aspirin like compound possessing antibacterial and anti-inflammatory properties. Studies report that some compound affect both GJIC and proliferation of diabetic fibroblast, thus leading to causing charges in signaling pathways for FGF-2, thus it neutralizes and binds with the FGF-2 receptor[1].

Aloe plant also contains substances such as gibberellins, which is a growth factor that possibly plays an important role in anti-inflammatory activity and wound healing. Steroids inhibit inflammation but also retards wound healing. This study reveals new relationship between inflammation and wound healing. According to this, *Aloe Vera* and gibberellins reduces inflammation without retarding wound healing having similar effects in normal and diabetic animals. Gibberellins can enhance wound healing in dose response manner as it is able of stimulating protein synthesis as well as RNA-DNA cellular systems. *Aloe Vera* and gibberellins can force the macrophages to generate growth factors that in turn stimulate fibroblast to form collagen and proteoglycans responsible for wound healing. According to the scientists, gibberellins, which is a plant growth hormone, can bind to a particular section of DNA and affecting the replication of DNA in a manner that it can make protein and so increasing protein synthesis, it can increase wound healing. According to Davis and his colleagues, some amino acids have also been identified in the plant possibly acting as the growth stimulants but particular role of these has yet not been determined[12].

EFFECTS ON TEXTILE MICROBES

In proper moisture, nutrients and temperature conditions, textiles serve as an excellent substrate for the proliferation of M.O. and growth of bacteria[37-38]. In hospitals, no. of bacteria can attach to the textiles that may contaminate the patients or other people coming in contact with it[6]. Pathogenic and non-pathogenic micro organisms, such as bacteria and fungus are normally present on the human body. The region such as human skin, nasal cavities and genital areas etc. are the prime sources of micro organism growth. Micro organism from our body gets attached directly to the clothes and spread on surrounding textiles through microbial shedding. This contamination of textiles in clinical conditions may lead to the spreading of pathogen to the air and thus inject the environment. This is a major reason responsible for hospital infections. Principle pathogenic micro organisms that have been found on textiles are *Klebsiella pneumonia, P. aeruginosa, S. auerus and Candida albicans.* This proliferation of micro organisms may sometimes reduce the quality of fiber by causing stains, or damage to the mechanical properties of the component fiber. In sensitive people, this contamination may generate atopic dermatitis. The risk of infections however could be reducing by using antimicrobial textiles.

ANTIMICROBIAL AGENTS FOR TEXTILES

Several types of synthetic antimicrobial agents are already used in the textile industry for a long time but now the researchers are focusing more on natural compounds. These should have the broad spectrum biocidal properties, effective against antibiotic resistant micro organism and should be safe enough for the humans to be used commercially; should be non-toxic, and bioreactive compounds. According to the studies, *Aloe* leaf also contains number of active compounds and antimicrobial properties, inhibiting the growth of *Mycobacterium, Trichophyton* and *B. subtilis* that could be exploited in the textile industry or for making medical textiles such as bandages, sutures etc[20]. In recent experiments conducted, *Aloe*

Vera, Chitosan and curcumin were tested on textiles such as cotton, wool, and rabbit hair alone, or in combination with other to judge the quality of their antimicrobial activity. It was found that when these substrates were pretreated (with peroxide or formic acid), then the natural ingredients show better antimicrobial as compared to activities on those substrates without the pretreatment. In fact, *Aloe Vera* alone has proved to be better than the Chitosan and curcumin, but its activity, however, shown to be enhanced by the addition of Chitosan and curcumin[3].

GASTROINTESTINAL FUNCTIONS

Aloe Vera also has many beneficial effects on digestive organs. It maintains normal digestion, absorption, elimination, performs as a puffer, regulates pH level of the stomach for the growth of healthy stomach flora and removes inflammatory process from the digestive system. It is considered safe for oral consumption. According to the experiments conducted on humans, it seems to have a toxic effect on the digestive tract. It reduced pH level and growth of yeast, thus improving the growth of bacterial flora. This in turn, improved the digestion and absorption of proteins[7].

EFFECTS IN DENTISTRY

Periodontal diseases and dental carries are the most infectious oral diseases that are associated to the microbial population of the oral cavities affecting humans across the world. Dental caries is mainly associated with the acidogenic species of bacteria that includes *S. mutans, Lactobacillus and Actinomyces.* These micro organism converts sucrose into lactic acid and other organic acid on the surface of the tooth particularly in the dental plaque. These consequently then dissolves calcium phosphates present in the enamel thus developing dental caries. Periodontal disease on the other hand, is caused by anaerobic gram negative rod shaped bacterial species that includes *A. actnomycetemcomitans , P. gingivalis, Bacteroids, Prevotella* and *fusobacterium* species. In one experiment conducted, *B. fragilis* was taken as an example of an opportunistic periodontopathogen, because according to several reports, *B. fragilis* were the pathogen most commonly isolated from the patients with periodontitis[13, 27, 40]. However despite having the ability to prevent infections in the oral cavity, antibiotics are not regularly used for preventing the formation of dental plaque, as there is always a risk that oral bacteria will become resistant against them. It was found that various oral infections could also be prevented with the use of extracts or oils of medicinal plant that have antimicrobial activities.

In one study exploiting the antimicrobial activities of *Aloe Vera* gel on some cariogenic and periodontopathogen were estimated. By using the disk diffusion and microdilution methods, twenty isolates of each of cariogenic species (*S. mutans*), periodontopathic (*Aggregatibacter, Actinomycetemcomitans, Porphyromonasgingivalis)* and an opportunistic periodontopathogen (*Bacteroids fragilis*), were taken and tested for their sensitivity and resistance to *Aloe* gel. Significant growth inhibition zone were produced by the gel investigated against all of the bacteria. The concentration of *Aloe Vera* gel used was directly proportional to the diameter of the growth inhibition zone. According to the results, *Aloe Vera* gel produced strong antimicrobial activity against both cariogenic and periodontopathic bacteria, producing zone of inhibition from 32-54 nm which was widest for *S. mutans* i.e. 54 nm and narrowest for *P. gingivalis* i.e. 32 nm. It was observed that MIC of *Aloe* gel was lower for cariogenic species than that for periodontopathic species, thus *Aloe* gel showed strong bactericidal activity against gram positive than that against gram negative bacteria. Thus, it was concluded that *S. mutans* were most sensitive to *Aloe Vera* gel than any other species; this could be because of the differences in the structure of both gram positive and gram negative bacteria[15]. This activity of *Aloe Vera* gel is due to the number of pharmacologically active compounds such as anthraquinones, saponins, aloin, aloe-emodin, anthracine etc. These due to the organic and natural compound present in *Aloe Vera*, the *Aloe* based tooth gel tends to very good

alternative for prevention of cariogenic and periodontal disease in people with sensitive teeth and gums, with the extra benefit of being less harsh on teeth. According to the recent study, three toothpastes including one *Aloe Vera* tooth gel and two commercially popular toothpaste were compared to determine the antimicrobial activities of *Aloe Vera* gel. All these three toothpastes were tested against oral infections producing seven pathogenic micro organisms. *Aloe Vera* gel based toothpaste was named as Toothpaste 'A' and the remaining two were named as Toothpaste 'B' and 'C'. All three toothpastes showed strong antimicrobial activity against *C. albicans* and anaerobes used. But toothpaste 'A' displayed maximum bactericidal effect against the bacterial species *S. milis* than the others. The toothpaste 'A' showed equal amount of antimicrobial activity despite having no fluoride content in it. So the gel showed strong bactericidal activity in the absence of fluoride content against *S. mitis* and it proved to be as effective as the other two commercially popular toothpaste (toothpaste 'B' & 'C') for controlling infectious diseases[18].

ANTIFUNGAL PROPERTIES

Candidiasis infections are mainly caused by *Candida* (fungus) in a variety of places such as oral (thrush), vaginal (yeast infections) and gastrointestinal. These are normally treated with the help of antifungal drugs, but *Aloe Vera* can remove Candidiasis infections with its natural antifungal properties. *Aloe Vera* shows its antifungal activities against other fungi such as *Candida Paraprilosis, Candida Krusei* and *Candida Albicans*[10]. The *Candida* yeast breeds in our intestine in an acidic environment, but *Aloe Vera* removes this with an alkalizing effect by alleviating constipation. Toxins collect in the colon region of our body, but *Aloe Vera* has laxative properties, which loosens the toxin and helps its removal from our system. *Aloe Vera* repairs and seals the damaged intestinal wall and prevents *Candida* from penetrating it. Thus *Aloe Vera* is specially proves to be of great help for the liver and act as the detoxifier. In one experiment conducted, the antifungal activity of *Aloe Vera* gel was determined. For this five pathogenic fungi i.e. *A. Niger, A. Flavus, Alternaria Alternata, Drechslera Hawaiensis* and *Penicillium Digitatum* were used. Different concentration of *Aloe Vera* gel was tested by agar diffusion plate method. It was observed that gel at 0.15%, 0.25% and 0.35% concentration showed significant reduction in the growth of fungi. The concentration of *Aloe Vera* in the medium was directly proportional to the rate of reduction of fungi growth. Thus, according to the results, *Aloe Vera* gel helps to inhibit the growth of all fungi that had been tested. However, out of five, against only two species of fungi i.e. *Alternaria Alternata* and *Drechslera Hawaiensis. Aloe Vera* gel showed poor antifungal properties at same concentration[49] . Papaya is one of the many tropical fruits present in India. But due to the perishable nature, it is very difficult to transport papaya to distant location and also in its storage. To protect papaya and to increase its shelf-life, edible coatings could be used[41]. New uses of *Aloe Vera* have recently been discovered, as an edible coating because of its antifungal properties. These natural edible coating provides a barrier against surrounding elements[19]. And thus, performs number of function such as preventing loss of moisture and firmness, control respiratory rate and maturation development, delay oxidative browning, delay fruit senescence[43]. Various other substances could also be added to this, so as to improve their performance of edible coatings. Such chemical or bio-based addition is incorporated to generate new edible coatings that control release of antioxidants, nutraceuticals and natural antimicrobial agents. One of these bio-based additives is the extracts of papaya leaves that possess antifungal activities. One study was conducted to determine the ability of *Aloe* gel based coatings in increasing the shell life of papaya and also to compare its antifungal properties with already established natural polysaccharide Chitosan. Chitosan is a natural carbohydrate polymer [beta-(1, 4)-glucosamine] which is derived from chitin, having capacity of formation of film[44], and also have antimicrobial activity. It was observed that PLEAG i.e. papaya leaf extract *Aloe* gel

based coatings showed much better results as compared to Chitosan coatings and *Aloe* gel coatings alone. PLEAG have been shown to improve controlled color development and fruit softening, retarding change in pH and titrable acidity. This indicates that PLEAG based coatings have comparatively extended the shell life of the fruit by delaying the ripening process and by modifying the respiration rate. In normal conditions, during ripening there is an increase in ethylene production in papaya. So it was concluded that that these coatings could have increase the resistance of skin of the fruit to gas permeability, and reducing the respiration rate, thereby reducing ethylene production due to the modified internal process. This ultimately resulted in the retardation of the ripening process. Thus they proved to be a cheaper, simpler method for increasing the post harvest shell life and quality of fruits and vegetables owing to their easy availability in the tropical parts of the world. Therefore, considering all the physiological changes, antimicrobial coating based on *Aloe* gel, is proved to be useful for extending the shelf life of papaya [32].

SIDE EFFECTS OF ALOE VERA

The preparations of *Aloe Vera* for their topical applications are generally considered as safe. However, according to the case studies of many reports, it was found that the topical applications of *Aloe Vera* preparations lead to the development of hypersensitivity reactions and contact dermatitis[16, 25, 35-36, 46]. The Anthraquinone component of the *Aloe Vera* is may be responsible for these reactions. In addition, the *Aloe Vera* gel, when applied orally has been reported to lower the blood glucose level. This in turn may increase the activity of treatments related to antidiabetes[2].

APPLICATIONS OF ALOE VERA

Table[42] 2
Clinical Applications of Aloe Vera

1. Antimicrobial	
a. Antibacterial	*Aloe* gel is bacteriostatic or bactericidal against a variety of common wound-infecting bacteria in vitro: *Staphylococcus auerus*, *Streptococcus pyogenes*, *Serratia marcescens, Klebsiella pneumoniae, Pseudomonas aeruginosa, E. coli, Salmonella typhosa* and *Mycobacterium tuberculosis*. Aloe-emodin also inhibits the growth of *Helicobacter pylori* in a dose dependent fashion.
b. Antiviral	Acemannan acts alone and synergistically with azidothymidine(AZT) and Acemannan hydrogel is used as treatment for persons infected with HIV relevant to CD44. *Aloe Vera* extract (0.5%) in a hydrophilic cream had significantly enhanced healed lesions.
c. Antifungal	*Aloe* extract treatment of guinea pig feet that had been infected with Trichophyton mentagrophytes resulted in a 70% growth inhibition compared with untreated animals
2. Antineoplastic	Aloin A and B, aloes in and aloeresin were devoid of antitumor activity effects on human K562 leukemia cell lines. Acemannan has demonstrated activity against feline leukemia virus and solid and malignant tumors 28 and inhibits hepatic tumor induction. In preliminary studies it has been significantly enhanced neatly a year survival.
3. Endocrine	*Aloe* gel has been shown to lower blood sugar in diabetic mice, as well as normal mice. Nearly half of diabetic patients surveyed in Texas reported using *Aloe Vera* or other herbal remedies as complementary therapies for their diabetes. *Aloe* gel to enhance the hypoglycemic effect of glibenclamide when given orally to diabetic patients.
4.Gastrointestinal	Stimulant laxative (leaf lining), gastric and duodenal ulcers (gel), inflammatory bowel disease.
a. Laxative	Barbaloin, or loin, derived from inner sheath cells of the leaves, is a bitter, yellow laxative. Affects the sodium/potassium pump and chloride channels at colonic membrane. Aloe's Anthraquinones enhance intestinal population and water secretion in mice. The Anthraquinones present in latex stimulate chloride and water secretion in large intestine, inhibits its reabsorption and stimulate peristalsis, and acts as a cathartic in chronically constipated adults.
b. Gastric and duodenal ulcers	Aloe-emodin inhibits growth Helicobacter pylori in a dose –dependent fashion. *Aloe Vera* inhibits gastric acid secretion in mice and rats and has protective effects against gastric mucosal damage in rats, *Aloe Vera* extract reduced aspirin-induced gastric mucosal injury in experimental rats, and extracts also suppressed the ulcerogenic effects of stress in experimental rats.
c. Inflammatory bowel disease	Acemannan is under consideration as an experimental remedy for inflammatory bowel disease.
5.Immune modulation	Acemannan acts as immune stimulant and anti-inflammatory, increases monocyte and macrophage activity and cytotoxicity, stimulates killer T-cells and enhances macrophage *candida*cidal activity in vitro. Acemannan enhances macrophage release of interleukin-1 (IL-1), interleukin-6 (IL-6), tumor

	necrosis factor alpha (TNF-α), and interferon gamma (INF-γ) in a dose dependent fashion. *Aloe* extracts also blocks prostaglandin and thromboxane production from arachidonic acid, reducing inflammation. Acetylated mannans from *Aloe* in mice stimulated an increase in white blood counts, splenic cellularity, and absolute numbers of neutrophils, lymphocytes and monocytes. *Aloe* reduced the production of interleukin-10 following exposure to ultraviolet radiation, reduces the suppression of delayed type hypersensitivity and blocked mast cell inflammatory responses to antigen-antibody complexes.

CONCLUSION

Aloe Vera because of its ecofriendly nature and non-toxic properties is a promising candidate for niche applications such as in medical, dental and health care textiles. Due to the availability of the *Aloe Vera* in bulk quantity, easy process of extraction, purification and sterilization made it a standard product that can face the challenges and still can be a good area of innovation in the world of bioactive compounds. Several reports have confirmed and discovered the various possible uses of *Aloe Vera*. In many studies that we have gone through, it was observed that the ability of organism to activate the wound healing process effectively and promptly is essential for its survival. *Aloe Vera* leaf gel extract thus by showing a significant prophylactic action helps the speeding up of healing process. The ethanolic extract of *Aloe Vera* leaf gel showed antimicrobial properties and thus showed a better result against various gram positive and gram negative bacteria as comparable to conventional antibiotics. Wound healing by the use of synthetic drug is not only expensive but also generates side effects such as allergy, drug resistance and this situation has forced the researchers to seek alternative drugs. This situation on contrary promotes wound healing by the use of traditional system of medicine.The potential use of *Aloe Vera* for oral hygiene has been evaluated in many studies, thus determining the antibacterial and antifungal properties of *Aloe Vera*. *Aloe Vera* act upon dental caries and periodontal diseases and helps in reducing the inflammation and pain and aids in healing. The antimicrobial effect of *Aloe Vera* has shown its major contribution to the plant's natural anthraquinones. These anthraquinones in small concentration with the gel fraction provides analgesic antibacterial and antifungal activities. *Aloe Vera* without any added fluoride content exerts almost an equal amount of antimicrobial activity as exerted by a majority of the commercially available tooth paste. Many studies have revealed that excessive use of antibiotics to kill etiological agents of oral infections led to the development of multidrug resistant bacteria. Therefore, to overcome this problem natural phytochemicals isolated from *Aloe Vera* have been considered useful alternative due to its less toxicity and better antimicrobial activity.

Another use of *Aloe Vera* gel as an antimicrobial agent on cotton fabric has been reported on several studies. Wasif *et al* used *Aloe Vera* gel extract at different concentrations in presence of cross linking agent glyoxal by pad-dry-cure technique. This attempt was made to import antimicrobial finishing on the cotton woven fabric. These researchers showed reduction in the number of colonies thus proving that *Aloe Vera* treated cotton fabric can be a better biocidal textile. *Aloe Vera* gel applied as edible coating in papaya fruit has beneficial effect in retarding the ripening process thus showing its antifungal activity. *Aloe Vera* treatments act as the physical barrier and thus reduce the weight loss during post harvest storage. This review concluded that *Aloe Vera* can show its antifungal properties by blocking the fungus that causes infection. On the human body as well as it shows counterattacks on the factors that allow the growth of fungus and the fungus and the plants including fruits. *Aloe Vera*, in nearly all cases, is farmed organically and sustainably and according to International *Aloe* Science Council, almost all *Aloe* is grown without the use of pesticide. Thus, keeping all these points in view, this literature concludes that *Aloe Vera* can be an ecofriendly and cost effective alternative to many chemical agents and antibiotics.

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