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Therapeutic application of aloe vera

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ABSRTACT:
Herbal medicine has a long history of use in many cultures around the world for the treatment of many infectious diseases. One crucial element of conventional medicine is aloe vera.Since ancient times, people have known and used the aloe vera plant for its benefits to health, beauty, healing, and skin care. Aloe, which has more than 300 species, primarily grows in arid regions of Africa, Asia, Europe, and America. Aloe Vera is a characteristic product that is currently frequently used in the cosmetology industry.The leaves of this amazing medicinal plant are rich in many bioactive chemicals that have emollient, purgative, anti-inflammatory, antioxidant, antibacterial, anti-helmenthic, antifungal, aphrodisiac, antiseptic, and other beneficial properties. aesthetic. Due to its healing and nourishing qualities, this plant is widely used in the beauty industry.

Key word Aloe vera: antibacterial, bioactive substance, and ethanol-based plant.

I. INTRODUCTION:

The Arabic word alloeh, which means a dazzling bitter material, is the source of the English term aloe[1] .Aloe Barbadensis miller is the name of the plant that produces aloe vera. It is a perennial, xerophytica, shrubby or arborescent, succulent colony that is a member of the Liliaceae family. Africa, Asia, Europe, and America's dry climates are where it primarily grows. Rajasthan, Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu are among the Indian states that have it [2]. Aloe vera is a very potent and significant herbal plant that has a wide range of medical applications and pharmacological effects on both humans and animals[3].Aloe vera is a resilient, drought-resistant, tropical, perennial plant. Aleo vera has produced a significant traditional function in indigenous medical systems like the Siddha, Homeopathy, Ayurveda, and Unani[4] .The Aloe vera leaf contains about 75 nutrients, 200 chemically active substances, including 20 minerals, 18 amino acids, and 12 vitamins, and it slows down the ageing process of the skin. Aloe vera eyewash shields the eyes from UV radiation when exposed to sunshine. Today, it is frequently found in cosmetics, juices, drinks, and pharmaceuticals. Coriander leaves were also examined for antibacterial activity. Food preservatives have been used for a long time to lengthen the shelf life of foods. Some methods include high salinity, high molasses systemic acid, alcohol, smoking, submersion in water, and underground storage. Chemical preservatives are widely utilised in the food processing industry as a result of industrial progress. . But, as the food business has grown and people's awareness of food safety has increased, there is a greater demand for food preservation techniques and a push to find safer, more effective preservatives.The fruit of coriander has been extensively researched and reported on both domestically and internationally. There are relatively few research reports about the physiological functions of stems and leaves, including antibacterial effectiveness, and their essential oil is primarily derived from their fruits. As a natural food preservative, it has a good chance of success[5]. The Aloe barbadensis plant has two distinct sections, each of which produces compounds with entirely different chemical makes-ups and medicinal benefits. The parenchymal tissue, which makes up the inner portion of aloe leaves, is what creates the clear, thin, flavourless substance known as aloe vera gel (or mucilage). By separating the gel from the inner cellular waste, this tissue can be extracted from the leaf. The pericyclic tubules, a collection of specialised cellsfound immediately below the leaf's outer green rind, make up the other component of the plant.These cells secrete an exudate that has potent laxative-like effects and is composed of a bitter yellow latex[2].

II. DESCRIPTION

Aloe vera can grow to be 60-100 cm (24-39 in) tall and spread via offsets. It may also have very small stems. With a few assortments emerging

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white bits on their upper and lower stem surfaces, the clears out are thick and plump, green to grey-green[6]. The leaf's margin contains tiny white teeth and a serrated texture. Each pendulous summer bloom has a yellow tubular corolla that is 2-3 cm (0.8-1.2 in) long and measures up to 90 cm (35 in) in height[6, 7]. Aloe Vera forms arbuscular mycorrhiza, a beneficial it'sinteraction that gives the plant a greater access to mineral supplements in soil .This is similar to other Aloe species[8].

III. HISTORY:

Greece, Egypt, India, Mexico, Japan, and China are just a few of the cultures that have employed aloe vera for therapeutic purposes for millennia. Nefertiti and Cleopatra, two Egyptian queens, included it in their regular beauty regimens. It was used to cure soldiers' wounds by Alexander the Great and Christopher Columbus. John Goodyew's translation of Dioscorides' medical book De Materia Medica in A.D. 1655 had the earliest mention of aloe vera in written English. Aloe vera was being used as a laxative in the United States by the early 1800s, but it wasn't until the mid-1930s when it was successfully utilised to treat chronic and severe radiation dermatitis that things started to change[9].

TOXONOMY

Kingdom- Plantae
Order- Asparagales
Division- Spermatophyte
Subdivision- Angiospermae
Class- Monocotyledoneae
Genus- Aloe
Species- Barbadensis Mill[10]
Synonym : Aloe, Musabbar, Kumari

BIOLOGICAL SOURCE [11]

Aloe Vera is made up of the fresh juice that has been extracted through cutting from the bases of the leaves of various aloe species. Aloe perryi, also known as Aloe ferox and Aloe barbadensis Mil. It is a member of the Liliaceae family

MORPHOLOGICAL FEATURE:

Taste: Bitter
Odour: No odour is present.
Size and Form: Plant lance grows to 60-100 cm**,**shaped having strands that are longer
Colour:Leaves range in colour from green to grey.– a green
Flower: Flowers are yellow tubular and are 25–35 cm in length.
Root: Root fibres with a length of 30 to 40 cm [12]

GEOGHRAPHICAL SOURCE:

Aloe vera is native to East and South Africa, but it has also been introduced to the West Indies and modern countries. It even grows well in areas that are close to the Mediterranean. It is present in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra, the United Kingdom, Himachal Pradesh, and Tamil Nadu in India. Aruba, Bonaire, Haiti, India, South Africa, the United States, and Venezuala are countries where it is economically established. It is now a common family solution for a variety of uses[13].

CHEMICAL CONSTITUENTS:

Vitamin: The plant includes a variety of vitamins, including the antioxidant vitamins A, C, and E. Thiamine, niacin, riboflavin, vitamin B12, choline, and folic acid are also present[14]. Free radicals are neutralised by antioxidants.
Enzyme : Amylases, lipases, alkaline phophatases, cellulases, catalases, and peroxidases are examples of enzymes that break down sugars and fats to aid in digestion. By inactivating bradykinins, carboxy peptidases and bradykinases reduce inflammation[15,16]. The anti-tumor properties is shown by lectins[17].
Mineral: The aloe plant contains a variety of minerals, including sodium, potassium, calcium, magnesium, selenium, manganese, copper, zinc, chromium, and iron. These minerals are essential for the proper operation of enzymes that are involved in different metabolic pathways. Several of these have antioxidant properties[16].
Sugars: are found in the mucilaginous layer of the plant, which is under the leaf's rind. It contains both polysaccharides (such as fructose and glucose) and monosaccharides (glucomannose and polymannose). The polysaccharides modulate the immune system[17,18]. A excellent moisturiser, glutmannan is utilised in cosmetics.
Anthraquinone: Barbaloin, aloeemodin-9-anthrone, lsobarbaloin, anthrone-C-glycosides, and chromones are among the anthraquinones and their derivatives found in the bitter reddish yellow exudates that are found behind the outer green rind. These are phenolic substances, which have historically been used as laxatives. When present in large amounts, these chemicals have a severe purgative impact, but when present in lesser amounts, they appear to enhance gastrointestinal

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absorption, act as potent antibacterial agents, and have potent analgesic effects [15].

Sterols : Cholesterol, campesterol, -sitosterol, and lupeol are examples of sterols. Many of them have anti-inflammatory effects, and lupeol has antibacterial and analgesic qualities as well[14, 16].

Harmone: Gibberellins and auxins promote wound healing and have anti-inflammatory properties.

Salicylic acid: is a substance similar to aspirin that has anti-inflammatory and antibacterial properties.

Amino acid: Aloe vera gel offers the amino acids needed for development and repair. It contains 7 of the 8 essential amino acids and 20 of the 22 non-essential amino acids[15].

Lignin: is an inert chemical that, when added to topical therapies, increases the other compounds' ability to penetrate the skin[16].

Saponins: are the soap-like compounds with cleaning and antiseptic properties[16].

EXTRACTION PROCESS:

The main bioactive component of aloe vera, acemannan, is present in the plant after it has been extracted.

Extraction of Acemannan=Acemannan is a polysaccharide made up of (1,4)-linked highly acetylated mannoses, (1,4)-linked glucose, and (1,6)-linked galactose, and it is present in interior leaf aloe gel [19,20]. As the methods used to extract the bioactive components of aloe, such as acemannan, are always very different (Table 1). Figure, where the molecular structure is taken from depicts the separation process[21].

The traditional, most practical method of laboratory extraction is often extraction in hot water and ethanol, which has been extensively utilised in industry [22,23]. The Aloe vera is cleaned, homogenised, separated, and centrifuged as part of the water exaction technique. Absolute ethanol was combined in a 1:3 ratio with the supernatant after being collected. The centrifuge was used to separate the white precipitate. Acemannan was obtained as opaque white particles by dialysis and freeze-drying [24]. The yield of traditional water extraction is significantly impacted by the liquid to solids ratio. The typical range of extraction temperature and time is 80–100 °C, 0.5–6 h [25,26]. The most common method, water extraction, has drawbacks such as prolonged high temperatures, low efficiency, and potential polysaccharide breakdown, which result in significant energy and time expenditures. The extraction conditions must be improved as a result. Several investigations have demonstrated that cellulose and aloe polysaccharide were partially digested [27].

ACEMANNAN SEPARATION AND PURIFICATION :

Following extraction, ethanol precipitation is the primary method for obtaining the crude extracts (Table 1). Further separation and purification are required in order to obtain acemannan because such polysaccharides typically contain proteins, colours, and tiny molecular compounds. Crude extracts were separated and purified using anion exchange chromatography in conjunction with gel permeation chromatography (DEAE-Sephadex A-25 column) [28,29] and conventional membrane separation [30]. However, gradient ethanol precipitation method and gradient ammonium sulphate precipitation method have recently been adopted in light of the lengthy fractionation time, cheap cost, and membrane vulnerability. Moreover, the separation and purification of acemannan uses membranes with unique structural and functional characteristics. Using ultrafiltration cells from an Amicon and the appropriate molecular weight cut-off membrane, acemannan was fractionated.[31,33]

Moreover, an alternate carrier for the electrophoretic separation of crude extracts was electrospun cellulose acetate membrane. It was employed as a straightforward technical benefit for separation of high molecular weight and near molecular weight polysaccharides by changing the porosity and pore size of the membrane [32].

MEDICINAL USE OF ALOE VERA :

Antineoplastic, cathartic, carminative, deobstuent, depurative, diuretic, stomachic, and emmenagoge are all properties of aloe vera. Juice is used in the treatment of healthy skin, dyspepsia, amenorrhea, smoulders, colic, hyperdenosis, blockage, range, menorrhagia, stomach, tumours, dropsy carbuncles, sciatica, lumbago, and flatulence. Pressure ulcers and ulcerative colitis are both greatly helped by aloe vera gel [34].

a. Anti-ulcer properties

This research was done to determine how Aloe vera affected the ulcers that indomethacin caused in rats. Aloe vera showed demonstrably fundamental anti-ulcer action comparable to that of omeprazole, a common pharmaceutical. Two medications' average ulcer histories are shaped to be statically simple. As a result, the findings

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indicated that aloe vera may be at risk for developing ulcers. The cell frameworks for these activities have not yet been developed, though[36].

b. Anticancer properties

It has not been thoroughly assessed how much of a contribution aloe vera made to nature's ability to cause cancer. Although it has been hypothesised that abuse of anthranoid-containing intestinal medications contributes to colorectal tumours, no evidence of a causal relationship between misuse of anthranoid diuretics and colorectal cancer has been shown. Aloe vera juice helps the body heal itself from additional damage caused by chemotherapy and radiotherapy, which destroy healthy, safe, and resilient cells necessary for recovery. Aloe vera emodin, an anthraquinone, has antagonistic anti-neoplastic capabilities since it can smother or regulate the progression of undermining or repress and supressed the development of dangerous growth bringing about cells [35] .

c.Antiseptic

The close closeness of six clean experts, including lupeol, salicylic destructive, urea nitrogen, cinnamonic destructive, phenols, and sulphur, is what gives aloe vera its sterile quality. These mixtures have a disease-inhibiting effect on parasites, germs, and other organisms. Despite the fact that many of these applications seem fascinating, controlled studies are necessary to determine their applicability to all diseases[37].

d.Anti-Inflamentarory

Aloe vera is a potent active ingredient in the creation of herbal medicines. The recently discovered calming substance known as Cglucosyl chromone was separated from gel extracts because it inhibited the cyclooxygenase lowers prostaglandin E2 creation from arachidonic corrosive. Aloe vera is a highly helpful herb in the treatment of inflammation [38].

e. Antimicrobial activity

In a monolayer society, pseudomonas aeruginosa was resistant to aloe vera gel's bactericidal effects on it and was prevented from adhering to human lungs epithelial cells by acemannan. A properly prepared Aloe vera gel preparation hampered Candida albicans' ability to grow. The remaining 0.7% of the gel is solid with starches making up the majority of its components. The gel is 99.3% water. Aloe leaf extracts are extracted and used as a diuretic and haemorrhoid therapy. Aloe gel helps strengthen the body's defence system. Both glucomannan and acemannan have been shown to have antibacterial and antiviral properties as well as the ability to invigorate macrophages that are actively healing wounds. The preliminary phytochemistry showed that tannins, flavonoids, and terpenoids are closely related. Aloe secundiflora may be a rich source of antibacterial agents, and residents in the needy Victoria district of Kenya use it for this purpose [38] .

f. Anti-microbial action

It has been claimed that a purified aloe vera gel preparation inhibited the growth of fungus albbicans. Strong antifungal efficacy against Candida paraprilosis, Candida krusei, and Candida albicans has been seen in the isolated aloe proteins[36].

g.Chronotropic Activity

By reducing the heart rate through chronotropic (heart rate) influences, the diastolic period—the interval between actual solid contractions [the systolic period]—expands. The heart chambers are filled with blood and ready for the next beat during the diastolic phase. But nevertheless, this is the moment when the heart relaxes and receives its own nourishment, which is typically just as important. The diastolic cardiovascular support time period is too brief if the heart rate is too high. The heart's ability to pump and circulate blood is reduced as a result[39].

h. Diabetes Prevention

The main obstacle to more comprehensive clinical research on aloe vera gel is the scarcity of studies that have been done. . A few clinical research are being conducted to test the efficacy of aloe vera gel in treating a variety of clutters and to support existing usages of the plant extract[39].

i. Antioxidant function

This study used human erythrocytes exposed to the water-soluble free radical initiator 2.2'-azobis-2-amidinopropano dihydrochloride to measure the effects of Aloe vera fluid concentrate on oxidative damage and Anion Exchanger 1 (AE1, also known as Band 3) expression (AAPH). Also, the concentrates' additional phenolic blends were identified as catechin-corresponding, and various cancer-fighting operator actions were distinguished from customary and built-in cell fortifications like BHA and ascorbic acid. Aloe vera extract does not

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continue auto oxidation under these test conditions since it did not result in the utilisation of the cytosolic cancer prevention agent, glutathione (GSH), when it was immediately hatched with GSH in basic circulating air through fluid arrangement[38].

j. Antiviral function

The antiviral activity of an uncomfortable hot glycerine concentrate of aloe vera gel produced in Bushehr, southwest Iran, was tested in this study against HSV-2 replication in the Vero cell line. The concentrate showed antiviral evolution against HSV-2 not only before to association and region of disease to the Vero cells, but also on post association times of contamination replication. Aloe vera blends from Bushehr could therefore be a respectable source for trademarks [40] .

DRUG INTERACTION

Enhance the effects of corticosteroids, thiazide diuretics, loop diuretics, liquorice, and cardiac glycosides. Several drugs' absorption rates can be decreased when aloe gel is used orally. It should therefore be taken two hours after taking any other prescriptions. A study found that aloe vera preparations enhanced vitamin C and E absorption[41].

SIDE EFFECT

Extended use : If taken for an extended period of time, oral aloe can result in electrolyte imbalances and dehydration as well as cramping and diarrhoea. Long-term use of aloe may increase the risk of colorectal tumour.

Gastrointestinal symptoms: signs of the digestive system Aloin, which is frequently to blame for digestive issues, shouldn't be present in aloe gel. Before a colonoscopy, people should refrain from consuming aloe vera for a month since it might discolour the colon and make visualisation challenging.

Allergies :Those who are overly sensitive to tulips, garlic, and onions are more likely to be sensitive to aloe.

Cancer-causing potential According to tumours of the large intestine, the 2-year study of an aloe vera nondecolorized whole leaf concentrate added to animal drinking water found conclusive evidence of its ability to cause cancer in male and female rodents[39].

IV. CONCLUSION

With its many therapeutic benefits, aloe vera is a medicinal plant that has been used for centuries. Aloe vera's chemical makeup is particularly intriguing because a number of its constituents have medicinal and pharmacological characteristics. Aloe vera cultivation is becoming very important commercially for cosmetics and pharmaceuticals. India's farmers frequently deal with issues including a lack of rain, a low groundwater table, degraded land, etc. Aloe vera can be grown in a variety of ecological environments, and it can generate consistent revenue and significant returns on investment.

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