International Journal of Pharmaceutical Research and Development (IJPRD)
Platform for Pharmaceutical Researches & Ideas
www.ijprd.com

ALOE VERA- A WIDE SPECTRUM ACTIVITY HERBAL DRUG: A OVERVIEW

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ABSTRACT
Aloe veradrought-resisting, perennial, plant belonging to Liliaceae Family. Aloe vera is historically has been used for variety of medicinal purposes. It has a very important role in indigenous systems of medicines like Ayurveda, siddha, unani and homoeopathy. Clinically evaluation of aloe vera concluded that the active pharmacological ingredients of aloe vera in both the gel rind of aloe vera leaves. The formulation of aloe vera are very effective in various kinds of treatment, such allergic reaction, rheumatic fever, acid indigestion, ulcers, diabetes, skin diseases, dysentery, piles, diarrohoea, rheumatoid arthritis, burns and inflammatory conditions of digestive system and internal organs like stomach, intestine, kidney, liver and pancreas. Aloe vera also shown to have analgesic, anti-inflammatory and anticancer activity. This review therefore give a detailed survey of literature of the phytochemical and pharmacological properties of aloe vera.

Key words: *ayurveda, pharmacology, ani-inflammatory, gastro-protective, aloe vera.*

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The Egyptians called Aloe the "Plant of Immortality" because it can live and even bloom without soil. Aloe hasbeen used medicinally since at least the first century C.E. and continues to be used extensively worldwide.

Synonyms

Grihakanya, Kanya,Ghritakumari,Vipulasrava,Sthuladala,Dirgha patra, Mandala, Kumari.

Biological source

Dried juice of Aloe ferox Mill, A. PerryBaker, A. Vera(L.) N.L. Burm. (= A. barbadensis Mill.)

Botanical name

Aloe ferox Mill, A. PerryBaker, A. Vera(L.) N.L. Burm. (= A. barbadensis Mill.)

Family: Liliaceae.

Geographical source

Aloes is indigenous to eastern and southern Africa and grown in cape colony, Zanzibar and islands of Socotra,also cultivated in Europe and many parts of India including northwest Himalayan region.

INTRODUCTION

Aloe Vera, also known as the true or medicinal aloe, is a species of succulent plant in the genus Aloe that is believed to have originated in the Sudan. Aloe Vera grows in arid climates and is widely distributed in Africa, India, and other arid areas. The species is frequently cited as being used in herbal medicine. Many scientific studies of the use of aloe Vera have been undertaken, some of them conflicting. Despite these limitations, there is some preliminary evidence that Aloe Vera extracts may be useful in the treatment of wound and burn healing, minor skin infections, sebaceous cyst, diabetes, and elevated blood lipids in humans. These positive effects are thought to be due to the presence of compounds such as polysaccharides, mannans, anthraquinones, and lecithins.Aloe Vera is a stemless or very short-stemmed succulent plant growing to 60–100 cm (24–39 in) tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on the upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm (35 in) tall, each flower pendulous, with a yellow tubular corolla 2–3 cm (0.8–1.2 in) long. Like other Aloe species, Aloe Vera forms arbuscular mycorrhiza, a symbiosis that allows the plant better access to mineral nutrients in soil.

Alternative names

- In India, Aloe Vera is known as Korphad, Kattar vazha and various other regional names.
- In Pakistan, the plant is known as Quargandal.
- In Indonesia, it is known as LidahBuaya (or "Crocodile's Tongue").
- In Thailand, it is known as the "Crocodile Tail".
- In Vietnam, it is known as the "Nha Dam" plant.
- In Latin America and the Philippines, it is often called either "Savia", "Savila", or "Sabila".

History

Ancient recordings that date back to 1500 B.C. reveal that aloe Vera aided the Egyptians in the healing of burns, infections and the removal of parasites from the body. Records indicate that even Cleopatra herself used the gel of the aloe Vera plant on her skin to maintain her youthful appearance. The Ancient Indians and Chinese also utilized aloe Vera in their holistic practices. Used for centuries in the Philippines, aloe Vera combined with milk helps to combat kidney infections.

Geography

Semi-tropical, the aloe Vera plant only grows in areas that are free of freezing temperatures. Aloe Vera prefers the sunny, well-drained soils of USDA hardiness zones 10 and 11, where the winter temperatures do not drop any lower than 30 degrees F. Outside of these zones, the aloe Vera plant must grow indoors, in a pot filled with damp potting soil. Bright, theindirect sunlight is required for healthy growth.

Identification

Mature aloe Vera plant grows to a height of approximately 36 inches. The thick, fleshy leaves of the plant are green-gray in appearance with serrated edges. Each of the leaves consist of four layers, which includes the rind, sap, mucilage gel and the inner gel. The rind is the outer protective layer of the leaf, lined with the bitter sap that makes the taste of the leaves undesirable to wildlife. The soft pulp of the mucilage gel lies beneath the sap, covering the inner gel, or aloe Vera gel, which is the essence of the plant.

Taxonomy and etymology

Spotted forms of Aloe Vera are sometimes known as Aloe Vera var. chinensis. The species has a number of synonyms: A. barbadensis Mill., Aloe indicaRoyle, Aloe perfoliata L. var. Vera and A. vulgaris Lam., and common names including Chinese Aloe, Indian Aloe, true Aloe, Barbados

Aloe, burn Aloe, first aid plant The species name Vera means "true" or "genuine."Techniques based on DNA comparison suggest that Aloe Vera is relatively closely related to Aloe perryi, a species that is endemic to Yemen.Similar techniques, using chloroplast DNA sequence comparison and ISSR profiling have also suggested that Aloe vera is closely related to Aloe forbesii, Aloe inermis, Aloe scobinifolia, Aloe sinkatana, and Aloe striata.With the exception of South African species A. striata,

Distribution

The natural range of Aloe vera is unclear, as the species has been widely cultivated throughout the world. Naturalized stands of the species occur in the southern half of the Arabian Peninsula, through North Africa (Morocco, Mauritania, and Egypt) as well as Sudan and neighboring countries, along with the Canary, Cape Verde, and Madeira Islands. This distribution is somewhat similar to the one of Euphorbia balsamifera, Pistaciaatlantica, and a few others, suggesting that a dry sclerophyl forest once covered large areas, but has been dramatically reduced due to desertification in the Sahara, leaving these few patches isolated. Several closely related species (or sometimes identical) can be found on the two extreme sides of the Sahara: Dragon trees and Aeonium being some of the most representative examples.The species was introduced to China and various parts of southern Europe in the 17th century. The species is widely naturalised elsewhere, occurring in temperate and tropical regions of Australia, Barbados, Belize, Nigeria, Paraguay and the US.

Cultivation

The species is popular with modern gardeners as a putatively medicinal plant and due to its interesting flowers, form, and succulence. This succulence enables the species to survive in areas of low natural rainfall, making it ideal for rockeries and other low-water use gardens.The species is hardy in zones 8–11, although it is intolerant of very heavy frost or snow. The species is relatively resistant to most insect pests, though spider mites, mealy bugs, scale insects, and aphid species may cause a decline in plant health. In pots, the species requires well-drained sandy potting soil and bright sunny conditions; however, in very hot and humid tropical or subtropical climates, aloe plants should be protected from direct sun and rain, as they will burn and/or turn mushy easily under these conditions.Potted plants should be allowed to completely dry prior to re-watering. When potted aloes become crowded with "pups" growing from the sides of the "mother plant," they should be divided and re-potted to allow room for further growth and help prevent pest infestations. During winter, Aloe vera may become dormant, during which little moisture is required. In areas that receive frost or snow, the species is best kept indoors or in heated glasshouses. Large scale agricultural production of Aloe vera is undertaken in Australia, Bangladesh, Cuba, the Dominican Republic, China, Mexico, India.

Biologically active compounds

Aloe veraleaves contain a range of biologically active compounds, the best-studied being acetylated mannans, polymannans, anthraquinone C-glycosides, anthrones and anthraquinones, and various lectins.

a)Anthraquinones:-

Aloe-emodin, aloetic acid, Aloin, Anthranol, Barbaloin, Isobarbaloin, Emodin, Ester of cinnamic acid.

b)Saccharides:-

Cellulose, Glucose, Mannose, Aldopentose, Acetylated mannan (acemannan)Glucomannan, Acetylatedglucomannan, galactogalacturan, glucogalactomannan, galactoglucoarabinomannan.

c)Vitamins:-

B1, B2, B6, C, Carotene, choline, folic acid, tocopherol.

d)Enzymes:-

Amylase, carboxypeptidase, catalase, cyclooxydase, lipase, oxidase.

e)Low-molecular-weight substances:-

Arachidonic acid, Cholesterol, Gibberellin, Lectin-like substance, lignins, Salicylic acid, sitosterol, Steroids, Triglycerides, Uric acid.

CHEMICAL TESTS FOR IDENTIFICATION

Name	Test	Observation	Inference
Schonteten test	5ml of 1% aqeous solution + 0.2gm of borax, heat pour few drops of above liquid into a test tube full of water.	Green flurescence	Anthranols.
Bromine test	2 ml of 1% aqueous solution+ 2ml bromine solution	Pale yellow precipitate	Aloin converts to tetrabromoaloin.
Nitric acid test	5ml of aq. Solution + 2ml bromine solution	A) brownish- red B) brownish red C) brownish yellow D) Brownish yellow.	Specific for aloes.
Nitrous acid test	Aq. Solution+ few crystals of sodium nitrite+ acetic acid	A) light pink B) deep pink C&D-very little Change in colour	Isobarbaloin.
Klunges test	20ml of 0.5% solution]+ a drop of saturated CuSO4 solution + 1gm NaCl+10 ml. alcohol (90%)l	A) faint reddish B) deep wine red C&D-no colour	Isobarbaloin

USES

A) Claims of medical properties

Scientific evidence for the cosmetic and therapeutic effectiveness of aloe vera is limited and when present is frequently contradictory. Despite this, the cosmetic and alternative medicine industries regularly make claims regarding the soothing, moisturizing, and healing properties of aloe vera, especially via Internet advertising. Aloe vera gel is used as an ingredient in commercially available lotion, yogurt, beverages, and some desserts.

Aloe vera juice is used for consumption and relief of digestive issues such as heartburn and irritable bowel syndrome, although it bears significant potential to be toxic when taken orally. It is common practice for cosmetic companies to add sap or other derivatives from aloe vera to products such as makeup, tissues, moisturizers, soaps, sunscreens, incense, shaving cream, and shampoos.

Other uses for extracts of aloe vera include the dilution of semen for the artificial fertilization of sheep, use as fresh food preservative, and use in water conservation in small farms. The supposed therapeutic uses of aloe vera are not exclusive to the species and may be found to a lesser or greater degree in the gels of all aloes, and indeed are shared with large numbers of plants belonging to the family Asphodelaceae. Bulbinefrutescens, for example, is used widely for the treatment of burns and a host of skin afflictions.

Aloe vera is non-toxic, with no known side effects, provided the aloin has been removed by processing. Taking aloe vera that contains aloin in excess amounts has been associated with various side-effects. However, the species is used widely in the traditional herbal medicine of China, Japan,

Russia, South Africa, the United States, Jamaica, Latin America and India.

Aloe vera may be effective in treatment of wounds. Evidence on the effects of its sap on wound healing, however, is limited and contradictory. Some studies, for example, show that aloe vera promotes the rates of healing, while, in contrast, other studies show that wounds to which aloe vera gel was applied were significantly slower to heal than those treated with conventional medical preparations.

Preliminary studies have suggested oral aoevera gel may reduce symptoms and inflammation in patients with ulcerative colitis. Compounds extracted from aloe vera have been used as an immunostimulant that aids in fighting cancers in cats and dogs; however, this treatment has not been scientifically tested in humans.

Topical application of aloe vera may be effective for genital herpes and psoriasis. However, it is not effective for the prevention of radiation-induced injuries. Although anecdotally useful, it has not been proven to offer protection from sunburn or suntan. In a double-blind clinical trial, both the group using an aloe vera containing dentifrice and the group using a fluoridated dentifrice had a reduction of gingivitis and plaque, but no statistically significant difference was found between the two.

Aloe vera extracts have antibacterial and antifungal activities, which may help in the treatment of minor skin infections, such as boils and benign skin cysts and have been shown to inhibit the growth of fungi that cause tinea. For bacteria, inner-leaf gel from aloe vera was shown to inhibit growth of Streptococcus and Shigella species in vitro. In contrast, aloe vera extracts failed to show antibiotic properties against Xanthomonas species.

B) Commodity uses:-

Aloe vera is now widely used on face tissues, where it is promoted as a moisturiser and/or anti-irritant to reduce chafing of the nose of users suffering hay-fever or cold. It has also been suggested that biofuels could be obtained from Aloe vera seeds. It can also be used to retwist dreadlocked hair, a favourite agent for vegans and those preferring natural products. Aloe vera is also used for soothing the skin, and keeping the skin moist to help avoid flaky scalp and skin in harsh and dry weather. Aloe Vera also works as a moisturizer for oily skin, it prevents the oil glands from overproducing oil.

VARIOUS PHARMACOLOGICAL ACTIVITIES OF ALOE VERA

1) Anti acne property:

This study was designed to investigate possible synergistic effect of aloe vera gel on the anti-acne properties of Ocimum gratissimum oil and to compare the activities of both agents singly and in combinations with the anti-acne agent Dalacin™ – a 1% Clindamycin phosphate solution.

Methods: 84 subjects presenting with clinically significant Acne vulgaris (mainly undergraduates of a University) were randomly assigned into seven groups and treated with different test preparations (2% v/v Ocimum oil lotion containing graded concentrations (0–≈100%) of aloe gel, placebo or control preparations). Samples tested were applied to the face after washing morning and evening. The numbers of inflammatory lesions (papules and pustules) were counted prior to application and daily for 4 weeks. The efficacy of the preparations was rated in terms of product activity (1/D), which is the reciprocal value of the number of days taken to achieve 50% reduction in lesion count.

Results: The efficacy of the Ocimum oil lotion products increased with increasing aloe gel contents. Products formulated with the undiluted or 50% aloe gels were most active and resolved inflammatory lesions faster than the standard product. The aloe gel alone showed minimal activity. Adverse effect was mild and tolerable.

Conclusion: Aloe vera gel enhanced the anti-acne properties of Ocimum oil; the oil or its combination with aloe vera gel is more effective than 1% Clindamycin in the treatment of Acne vulgaris.

2) In treatment of burn:-

Aloe vera has been used as a popular herbal medicine since ancient times for many conditions including burns. Much evidence has reported the efficacy of topical Aloe vera gel in the treatment of thermal burns through its different pharmacological actions. This review article consists of pathophysiology of the thermal burns, the botany and chemical constituents of Aloe vera, and therapeutic properties of Aloe vera on thermal burns. The mechanisms that may underlie its action include: anti-inflammation, antimicrobials, wound healing promotion, and biological/immunological modulation.

3) Wound healing property:-

We have studied the possible effects of Aloe vera gel on the healing of colonic anastomoses of rats.

Material and Methods: In this study, Sprague–Dawley rats were used. Aloe vera group received 2 mL/kg per day Aloe vera, and the control group received the same amount of water. Animals underwent resection and anastomosis of the distal colon. Bursting pressures of anastomoses and hydroxyproline contents of perianastomotic region were determined on the third and seventh days. Mann–Whitney U-test was used to compare bursting pressures and hydroxyproline levels between groups.

Results: There was no difference between groups in mortality. Mean bursting pressures and mean hydroxyproline levels were lower in the control group than in the Aloe vera group both on the third and seventh days.

Conclusion: Aloe vera has multiple pharmacologically active compounds. It stimulates phagocyte formation and its activity induces nitric oxide production, it has angiogenic activity, increases synthesis, maturation and cross-linking of collagen, stimulates cell proliferation, stimulates fibroblast functions and proliferation, inhibits arachidonic acid oxidation, has anti-inflammatory effects, reduces tumour necrosis factor- levels, and has antioxidant activity. Thus, according to our findings, Aloe vera has positive effects on the colonic anastomotic healing of rats. The crude ethanolic extracts of Mentha longifolia Linn. (Leaves and stem) and Aloe vera (leaves) were screened for various invitro biological and phannacological

4) Antifungal, antibacterial, insecticidal, phytotoxic activities:-

All the extracts exhibited remarkable (~6O %) phytotoxic activity in the highest tested concentration (500 ppm) against Lemna minor L. with Aloe vera extract showing complete inhibition of the studied plant. The Mentha longifolia Linn. (stem) and Aloe vera extracts were also explored to possess good (~55%) antifungal activities against Trichophyton longifusus, (75% and 60%), and Microsporum canis (65% and 55%), respectively while Mentha longifolia Linn. (Leaves) displayed only a weak (:5:50%) activity against Trichophyton longifusus and Fusarium solani (20% each). These extracts were found to be devoid of any antibacterial, insecticidal activities and Brine shrimp lethality during this study.

5) Agent for the clinical treatment of sepsis:-

The administration of Aloe veraameliorated the multiple organ dysfunction syndrome, as evidenced by the serum levels of biochemical parameters and histological changes. In order to investigate the pharmacological mechanism of Aloe vera, the levels of the cytokines, tumor necrosis factor (TNF)-a, interleukin (IL)-1b, and IL-6 were determined by ELISA at various time points. The increases in the levels of TNF-a, IL-1b, and IL-6 were attenuated by Aloe vera. In vivo administration of Aloe veraalso markedly enhanced bacterial clearance. Our findings suggest that Aloe vera could be a potential therapeutic.

6) Immunity enhancer & reducer of oxidative injury:-

The current investigation was conducted to examine the effects of A. vera polysaccharides on various in vivo parameters of innate immunity and antioxidant enzymes activities in oral ulcer animals. Forty wistar rats were randomly divided into the following 1 control group and3 experimental groups (each group contained 10 rats). Rats in experimental groups were orally fed by A.vera polysaccharides. Rats in control group were orally fed by same volume of saline. The results showed

that A. vera polysaccharides enhanced immunity activity and exerted antioxidant effects compared with vehicle controls. These results demonstrate, for the first time, that A. vera polysaccharides are effective in enhancing innate immunity and suppressing oxidative injury in oral ulcer animals.

7) Antiinflamatory activity:-

We studied the effects of aqueous, chloroform, and ethanol extracts of Aloe vera gel on carrageenan-induced edema in the rat paw, and neutrophil migration into the peritoneal cavity stimulated by carrageenan. We also studied the capacity of the aqueous extract to inhibit cyclooxygenase activity. The aqueous and chloroform extracts decreased the edema induced in the hind-paw and the number of neutrophils migrating into the peritoneal cavity, whereas the ethanol extract only decreased the number of neutrophils. The antiinflammatoryagent's indomethacin and dexamethasone also decreased carrageenan-induced edema and neutrophil migration.

The aqueous extract inhibited prostaglandin E 2 production from [~4C] arachidonic acid. The chemical tests performed in the aqueous extract for anthraglycosides, reductor sugars and cardiotonic glycosides were positive. In the ethanol extract, the chemical tests performed for saponins, carbohydrates naftoquinones, sterols, triterpenoids and anthraquinones were also positive. In the chloroform extract, the chemical tests performed for sterols type A 5, and anthraquinones were positive. These results demonstrated that the extracts of Aloe vera gel have antiinflammatory activity and suggested its inhibitory action on the arachidonic acid pathway via cyclooxygenase.

8) Skin permeation enhancer:-

The aim of this study was to determine in vitro the potential of Aloe Vera juice as a skin permeation enhancer; a secondary aim was to probe the extent to which Aloe Vera itself permeates the skin. Saturated solutions of caffeine, colchicine, mefenamic acid, oxybutynin, and quinine were prepared at 32 ◦C in Aloe Vera juice and water (control) and used to dose porcine ear skin mounted in Franz diffusion cells with water as receptor phase.

Receptor phase samples were taken over a 48 h period and permeants determined by reverse-phase HPLC. For caffeine and mefenamic acid no significant enhancements occurred between Aloe Vera and water as vehicles ($p > 0.05$). However, for colchicine, oxybutynin and quinine the presence of Aloe Vera within the formulation provided enhancements ($p \leq 0.05$). Enhancement potential was dependent upon the molecular weight of the drug in formulation, with the enhancement effect attributable to as yet unidentified components within the Aloe Vera.

Colchicine, with a molecular weight of 399.44, achieved the best enhancement with an enhancement ratio of 10.97. No correlation with lipophilicity was apparent. In a further experiment, where freeze-dried Aloe Vera was reconstituted at 200% residue level, permeation of quinine was 2.8× that from normal Aloe Vera, providing further evidence for the presence of an enhancing factor within Aloe Vera. Certain, although unidentified, components of Aloe Vera readily permeated skin and the relative amount by which they permeated skin was inversely related to the molecular weight of the drug in solution, thus enhancement ratio. A new mechanistic rationale is proposed whereby larger drug solutes inhibit the permeation of Aloe Vera components, but also are then able to interact more effectively with the enhancing factor and be subject to the pull effect.

9) Hypoglycemic activity:-

Aloe vera L. high molecular weight fractions (AHM) containing less than 10 ppm of barbaloin and polysaccharide(MW:1000 kDa) with glycoprotein, verectin(MW:29 kDa), were preparedby patented hyper-dry system in combination of freeze–dry technique with microwave and far infrared radiation.AHMproduced significant decrease in blood glucose level sustained for 6 weeks of the start of the study. Significant decrease in triglycerides was only observed 4 weeks after treatment and continued thereafter. No deterious

effects on kidney and liver functions were apparent.

10) Gastro protective agent against mucosal injury:-

The effect of varying doses of ethanol extract of Aloe vera (Liliaceae) on acute gastric mucosal lesions induced by 0.6M HCl and acid output was studied in the pylorus ligated and lumen perfuse rats, respectively. Acid secretion was determined by titration of the collected gastric juice to pH 7.0. Intraperitoneal injection of Aloe vera, dose dependently inhibited gastric acid secretion. The plant was more active as a gastro protective agent at lower concentration against mucosal injury induced by 0.6M HCl. In conclusion, Aloe vera is endowed with gastric acid anti-secretory activity and could protect the gastric mucosa at low concentrations against injurious agent.

11)Genotoxic potential on Escherichia coli and plasmid DNA:-

Aloe vera is a tropical plant, known in Brazil as babosa and several reputable suppliers produce a stabilized aloe gel for topic use. Since people use Aloe vera topically, they could be exposed to solar ultraviolet light in addition and it might cause a cross damage effect between these agents. The aim of this work was to investigate the biological effects of Aloe vera pulp extract, associated or not to UVA radiation, on Escherichia coli-deficient repair mutants and plasmid DNA, in order to test its genotoxic potential. Data obtained from analysis of survival fractions, bacterial transformation and agarose gel electrophoresis suggest that Aloe vera has genotoxic properties, but it seems not to be able to damage the cell membrane.

12)Effects of Aloe preparation on the histamine-induced gastric secretion in rats:-

The effects of Aloe preparation containing 80% Aloe gel on the gastric acid, pepsin and mucus secretion were evaluated in histamine-induced gastric fistula model in rats by comparison to the effects of placebo and fresh Aloe gel. Aloe preparation and placebo at a dose of 8 ml/kg inhibited gastric acid but stimulated pepsin secretory rates. On the other hand, fresh Aloe gel at a dose of 6.4 ml/kg prolonged histamine stimulatory effects on the gastric acid secretion while it inhibited gastric pepsin secretion. Both Aloe preparation and placebo increased soluble mucus secretory rate in a dose-dependent manner whereas fresh Aloe gel had no effect. The Aloe preparation and placebo at a dose of 8 ml/kg increased the gastric visible mucus content while fresh Aloe gel slightly increased the visible mucus content.

This study reveals that fresh Aloe gel prolonged the effects of histamine-stimulated acid secretion and inhibits pepsin secretion in histamine-treated rats. The Aloe preparation inhibited gastric acid, stimulated pepsin and mucus secretion. However, there were no difference in the secretory rates of Aloe preparation and placebo-treated rats at the same doses. This result indicates that the observed effects of Aloe preparation was mostly due to other compositions of the preparation rather than Aloe gel itself. Since the highest dose of Aloe gel preparation used in the present study was limited by the volume of the instillated solution in gastric fistula model, the effects of Aloe vera gel were not able to be observed in the present study might be due to the inadequate dose of the preparation.

13) Burn healing property:-

Four studies with a total of 371 patients were included in this review. Based on a met analysis using duration of wound healing as an outcome measure, the summary weighted mean difference in healing time of the aloe vera group was 8.79 days shorter than those in the control group (P = 0.006). Due to the differences of products and outcome measures, there is paucity to draw a specific conclusion regarding the effect of aloe vera for burn wound healing. However, cumulative evidence tends to support that aloe vera might be an effective interventions used in burn wound healing for first to second degree burns. Further, well-designed trials with sufficient details of the contents of aloe vera products should be carried out to determine the effectiveness of aloe vera.

14) Inhibitory effect on the mycelial growth of phytopathogenic fungi:-

The leaf pulp of Aloe vera, designated as the gel, and the bitter, yellow liquid fraction have been tested against pathogens (bacteria and fungi) affecting human and plants. However, their activity for fungal control in commercial industrial crops hasnot been determined. The objectives of this study were to evaluate the inhibitory effect of Aloe pulp and liquid fraction on the mycelial growth of three phytopathogenic fungi and to determine the extract concentrations that can inhibit mycelial development.

A. vera leaves were cut from plants grown under greenhouse conditions at the University Antonio Narro, disinfected with sodium hypochlorite, and separated in two groups. In the first group, the pulp was manually scraped out; in the second, a laboratory roll processor was used for the pulp and liquid fraction separation. Both types of extracts were pasteurized. Antifungal activity of pulp and liquid fraction was evaluated on the mycellium development of Rhizoctonia solani, Fusarium oxysporum, and Colletotrichum coccodes that were isolated from a potato crop by the hyphae point and monosporic techniques. The concentrations of the plant extract ranged from 0 to 105 l l−1. Fungal plugs 0.4mm in diameter were placed in Petri dishes with a potato–dextrose–agar (PDA) culture media, and treated with various concentrations of pulp or liquid fraction. The cultures were incubated at 24 ± 2 ◦C and the radial growth of mycelia measured daily for 7 days.

The antifungal effect was measured under a totally random design with four replications. The results showed an inhibitory effect of the pulp of A. Vera on F. oxysporum at 104 l l−1 and over a long period. For the two types of Aloe fractions the activities were similar. Besides the liquid fraction reduced the rate of colony growth at a concentration of 105 l 1−1 in R. solani, F. oxysporum, and C. coccodes. This is the first report of any Aloe liquid fraction activity against plant pathogenic fungi.

15) Improvement in the absorption vitamins C and E:-

There are no literature references describing the effect of consumption of Aloe vera liquid preparations on the absorption of water- or fat-soluble vitamins. There is a very large population worldwide which consume vitamins and many people also consume Aloe. Thus we report the effect of Aloe on the human absorption of vitamins C and E, the most popular vitamin supplements. The plasma bioavailability of vitamins C and E were determined in normal fasting subjects, with eight subjects for vitamin C and ten subjects for vitamin E. In a random crossover design, the subjects consumed either 500 mg of ascorbic acid or 420 mg of vitamin E acetate alone (control), or combined with 2 oz of two different Aloe preparations (a whole leaf extract, or an inner fillet gel). Blood was collected periodically up to 24 h after consumption. Plasma was analyzed for ascorbate and tocopherol by HPLC with UV detection. There was no significant difference in the areas under the plasma ascorbate–time curves among the groups sincerely due to large differences within the groups. For comparative purposes the control area was 100%. The Aloe Gel area was 304%, and Aloe Whole Leaf 80%.

Only Aloe Gel caused a significant increase in plasma ascorbate after 8 and 24 h. For vitamin E, the results for the relative areas were control 100%, Gel 369%, and Leaf (198%). Only the Aloes produced a significant increase in plasma tocopherol after 6 and 8 h. Both Aloes were significantly different from the control after 8 h. Aloe Gel was significantly different from the baseline after 24 h. The Aloes slowed down the absorption of both vitamins with maximum concentrations 2–4 h later than the control. There was no difference between the two types of Aloe. The results indicate that the Aloes improve the absorption of both vitamins C and E. The absorption is slower and the vitamins last longer in the plasma with the Aloes. Aloe is the only known supplement to increase the absorption of both of these vitamins and should be considered as a complement to them.

16) Medicinal Applications and Toxicological Activities of Aloe Products:-

Aloe (Lilliaceae) has long been used as a remedy in many cultures. *Aloe* products, which include the latex, gel, and whole leaf, are used, among other reasons, as laxatives, in creams for skin ailments, and as a treatment for a wide range of diseases, respectively. The heterogeneous nature of *Aloe* products may contribute to the diverse biological and therapeutic activities that have been observed. Variations in the composition of *Aloe* can result in products with different chemical and physical properties, making the comparison of products difficult. In this article, the chemistry, uses, pharmacological activity, and toxicity of *Aloe* gel, latex, and isolated compounds are reviewed. This article is confined to literature pertaining to *Aloe vera*(L.) Burm.f. (also known as *A. barbadensis* Miller) and *Aloe ferox* Miller since they are the most widely used species both commercially and for their therapeutic properties.

17) Antineoplastic activity:-

In vitro, aloe-emodin inhibits the growth of Merkel carcinoma cells (Wasserman, Fenig) liver cancer cell lines and human promyelocytic leukemia HL-60 cells (Chen); has antineuroectodermal tumor activity (Pecere); and induces apoptosis in lung carcinoma cell lines (Lee). Lectin-like substances from the leaves of *A. vera*have been shown to promote the growth of normal human cells in culture but inhibit tumor cell growth (Winters). However, in contrast, aloesin has been shown to stimulate the proliferation of cultured hepatoma SK-Hep 1 cells (Yagi & Takeo).

The anticancer activity of aloe-emodin is based on its promoting cell death by a neuroectodermal tumor-specific drug uptake. Aloe-emodin displays a reduced growth inhibitory and pro-apoptotic activity in p53 mutant cells with respect to the p53 wild-type line. After aloe-emodin treatment, p53 translocate to the mitochondria inter-membrane space in both neuroblastoma cell lines. Due to its high accumulation in neuroectodermal tumor cells, aloe-emodin could kill tumor cells harboring p53 mutant genes. This property would further contribute to aloe-emodin's specific antitumor activity.

Mijatovic investigated aloe-emodin's ability to modulate survival of mouse L929 fibrosarcoma and rat C6 astrocytoma cells through interference with the activation of inducible nitric oxide synthase and subsequent production of tumoricidal free radical nitric oxide. Aloe-emodin rescued interferon-*γ* interleukin-1-stimulated L929 cells from nitric oxide-dependent killing by reducing their autotoxic nitric oxide release. Aloe-emodin inhibition of tumor cell nitric oxide release coincided with a reduction in cytokine-induced accumulation of transcription and translation products of genes encoding inducible nitric oxide synthase and its transcription factor IRF-1. Aloe-emodin has the capacity to directly kill tumor cells but also to protect them from nitric oxide-mediated toxicity. *In vivo*, *Aloe* polysaccharides have antitumor effects in both Sarcoma 180- and Hepatoma 22-bearing mice, the effect possibly being derived from inducing IL-2 and TNF production and thus improving the immune response.

18) Protection of the liver and kidney

Liver

Intraperitoneal injections of aloe-emodin protected the livers of rats treated with CCl4, as shown by a reduction in the elevation of ALT and AST (Arosio). *A. vera*gel decreased the damage to the liver in neonatal streptozotocin-induced type II diabetic rats (Can). *Aloe* injections lowered the ALT by 87% in 38 HbsAg-positive patients with chronic hepatitis (Fan).

Woo determined that aloe-emodin is a potent inhibitor of hepatic stellate cell activation and proliferation, although the mechanism has not been elucidated. *Aloe* extract has a cytoprotective effect against 1, 4-naphthoquinone-induced hepatotoxicity in primary cultured rat hepatocytes (Norikura).

Kidney

In rat kidneys with mild damage caused by type II diabetes, *A. vera*gel extract led to improvement in both histological and biochemical parameters, suggesting a protective effect (Bolkent).

19) Hematological

Two Lectin glycoproteins, Aloctin I and Aloctin II, isolated from the leaf pulp showed hem agglutinating activity against rabbit erythrocytes *in vitro* (Winters Akev& Can). However, *Aloe* whole-leaf powder fed to rats for 90 days showed no adverse effects on hematological parameters (Zhou). The carbohydrate fraction of *A. vera*has been shown to have hematopoietic activity (Talmadge).

20) Hormonal activity:-

Aloe-emodin is a potent hypotensive agent leading to a 79% fall in arterial blood pressure at a dose of 3 mg/kg (Saleem).

*A. vera*leaf extracts (125 mg/kg) reduced the serum levels of both T3 and T4 in male mice, suggesting a possible use in the regulation of hyperthyroidism (Kar).

Anthraquinones have been traditionally used for the prevention and palliation of menoxenia and postmenopausal disease and, in an *in vitro* study, Matsuda found that *A. ferox* extracts enhanced proliferation of MCF-7 cells, indicating that they do, indeed, have estrogenic activity.

21) Neural:-

Diabetes mellitus has been reported to impair memory function in experimental animals. Since the mammalian hippocampus and cerebral cortex play a pivotal role in memory, Parihar examined the vulnerability of these regions of the brain to oxidative damage in streptozotocin-diabeticwhen supplemented with *A.vera*extracts, the oxidative damage in both brain regions was reduced, as shown by a significant decline in both lipid peroxidation and protein carbonyl. Memory impairment and motor dysfunction were also improved.

22) Activity on eyes:-

Biopharmaceutical studies by Kodym and Bujak concluded that the addition of *Aloe* extract to eye drops containing neomycin sulphate increased the permeation of the drug through the cornea, suggesting that it may have a role to play in the treatment of inflammations and infections of the eye.

23) Activity as cosmetics:-

In cosmetics, *Aloe* gel is added to cleansers, moisturizers, shampoos, suntan lotions, and sunburn screens. Aloesin modulates melanogenesis via competitive inhibition of tyrosinase, thus holding promise as a pigmentation-altering agent for cosmetic and therapeutic applications (Jones et al., 2002; Yagi & Takeo, 2003). When considering the physicochemical and microbiological stability of *Aloe* components, Kodym and Bujak (2002) determined that the most advisable base for such ointments is white vaseline, liquid paraffin, solid paraffin, or cholesterol.

24) Activity as food supplements:-

Aloe is a popular supplement in health foods, sold for the treatment of obesity, hyperlipidaemia, and acne (Wang). The internal use of the gel is regulated as a dietary supplement in the USA (Code of Federal Regulations, 1991) and Europe (Council of Europe, 1981). Use of the juice and integument of leaves of *A. vera*and *A. ferox* as food, however, is not permitted in Japan (Shioda). An edible coating based on *A. vera*gel has been shown to increase the cold storage and subsequent shelf life of grapes and, in addition, reduces the microbial counts of the stored product (Valverde).

ADVERSE EFFECTS- Hypersensitivity and allergic conditions to *Aloe* preparations have been reported.Exposure of rats to emodin resulted in an increased incidence of renal tubule pigmentation and nephropathy in mice. In rats that were fed *Aloe* whole leaf powder for 90 days, the kidney weight was significantly increased and, in males, testis weights were significantly increased. Additionally, the pigmentation in renal tubular, mesenteric lymph nodes, and lamina propria of the colonic mucosa were also significantly increased compared to the controls, and proliferation of mesenteric lymph nodes was observed. In humans, there are no published controlled toxicology studies *in vivo*, although several single-case reports are available. One patient experienced massive intraoperative bleeding after consumption of *A. vera*tablets. The cause seems to have been a possible herb-drug interaction between *A. vera*and sevoflurane. Luyck reported a patient with acute renal failure

following *Aloe* ingestion where no other cause could be found. A case of severe vomiting after *Aloe* ingestion was reported by Wang and Willemspublished a case of melanosis coli that developed after prolonged anthranoid self-medication. Acute hepatitis has been observed following *A. vera*ingestion and Henoch-Schonlein purpura after an *A. vera*herbal remedy juice was taken for back pain.Deaths have been reported following the use of *Aloe* as abortifacients. However, there is no evidence that the deaths were due to *Aloe* toxicity. Adverse effects of *Aloe* whole-leaf powder have been reported at concentrations of 2 g/kg BW, and the LOAEL for aloin is estimated at 11.8 g/kg BW. Pregnant women are advised not to take *Aloe* latex because of its cathartic action, which may cause severe uterine contractions and increase the risk of miscarriage. It should also not be ingested by nursing mothers because of the possibility of causing severe cramps and diarrhea in the infant.

CONCLUSION

From above study on Aloe vera, I had come to conclusion that aloe vera is one of best herbal plant used traditionally worldwide in various diseases because of its multiple biological activity.The no. of preparation containing aloe extract is vast and consist of pills, capsules, creams, powder, gel, aqueous solution etc.

The different pharmacological activities of aloe vera are as following

- Naturally-occurring antioxidants: vitamins C and E and vitamin A precursors
- Bradykinase: reduces excessive inflammation when applied to skin
- Mucopolysaccharides: immunoregulating effect
- Anthraquinones: aloin and emodin, which are phenolic compounds found in plant sap

(These compounds have anti-inflammatory, antibacterial and antiviral properties.)

- Saponins: antiseptic-antibacterial, antiviral, antifungal properties
- Campesterol, sisosterol, lupeol: plant steroids that may provide an anti-inflammatory effect
- Salicyclic acid: provides an anti-inflammatory effect
- Lignin: endows *Aloe vera*with its penetrative effect and carries other ingredients
- Is a “cooling herb”: most feather and skin conditions are referred to as “warm” disorders

Though aloe vera having profound biological activity it has some minor adverse effect such as hypersensitivity, changedcolour of urine when used internally, causedangerously low level of potassium ions in diabetespatient, if used for prolong time can cause diarrhea.

From the study I ultimately concluded that aloe vera is gift given by nature to human being.

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