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PHYTOCHEMICAL REVIEW OF *ALOE VERA* WITH EMPHASIS ON ITS COSMETIC APPLICABILITY

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ABSTRACT

Introduction: *Ever since the inception of man's perception towards beauty, there has been a constant inclination for the care of one's appearance. The concept of beauty of a person in Ayurveda is present as early as in Caraka Samhitā in the form of varnya dashemani. Beauty presents a standard of comparison, and it can cause resentment and dissatisfaction when not achieved. For the maintenance of beauty, there has been a dedicated branch of science i.e. cosmetics. Owing to side-effects like allergies, photosensitivity and even malignancies due to synthetic chemicals, there has been growing demand of plant based cosmetics. Aloe vera is one of the most versatile herbs used in the field of cosmetics.*

Aim: *The present review is undertaken to highlight the importance of aloe vera in the field of cosmeceuticals by analysing its phytochemical constituents critically.*

Materials and Methods: *Critical review of aloe vera is compiled from various Ayurvedic classical texts as well as multiple research articles and review articles from different streams of science to highlight its cosmetic applications.*

Result and Conclusion:*Aloe vera is found to be emollient, anti-microbial, anti-inflammatory, anti-oxidant, anti-fungal and anti-septic in terms of cosmetic applicability. Therefore, it's widespread use in cosmetics either directly or indirectly (as base material) is highly justified. It is, truly, a boon from Ayurveda.*

KEYWORDS

Beauty, cosmetics, aloe, review, classics, side-effects, anti-oxidant, anti-inflammatory, anti-microbial.

INTRODUCTION

The term Ayurveda combines the Sanskrit words *āyu* (life) and *veda* (science or knowledge). Ayurveda is an individualised system of medicine and a way of life. The tradition of Ayurveda is rooted in the idea that each of us is born with a completely personal blueprint for optimum health.

That blueprint is comprised of your own mix of three *'doshas'*, or energies: *vāta*, *pitta* and *kapha*. Each *dosha* is determined by specific physical, emotional, mental and social characteristics as they pertain to the five universal elements – fire, water, earth, air and space.

Between endless to-do lists, dire morning commutes and a less than encouraging bank balance, we're constantly looking for something to remedy our millennial stress and bolster our personal self-care revolution.

And our this need is fulfilled by Ayurveda, an ancient practice that feels more relevant (and necessary) today than ever before, Ayurveda is all about balancing your life to suit you. And handily it works in your beauty routine as well.

Pharmaceutical companies are now developing products that connect cosmetics, therapeutics and spirituality. Consumers are looking for products that

Presented at SAUNDARYA-2019: An International Conference on Beauty held on 15th& 16th November, 2019 by National Institute of Ayurveda, Jaipur & IConference, New Delhi

nourish their body and their mind with historical roots and time-honoured rituals.

Viewing our health through an Ayurvedic perspective, we will learn that skincare is not just down to the products that we use, it's about diet, sleep, exercise and your overall way of life. Ayurvedic formulations are often complex combinations of different types of herbs that offer the benefits of both synergy and balance, so that the final product is potent and highly effective without damaging side effects.

Everybody wants to be beautiful which gives pleasure to the sense. Beauty offers a source of joy and gives confidence and proud in some extent. Since Ancient time, it has been an intense desire of human beings to be more and more attractive and to attract somebody. We can find earliest references of beautifulness in *Meghadoota*, *AbhijnanaShakuntalam* of *Kalidasa* and many other mythological epics, drugs like*Kajal, Tilak*, *Alita* and *Agaru* (Aquilaria agallocha) were used as body decorative and to create beauty spots on the forehead, chin, cheeks, neck, umbilicus and flank and also wearing various ornaments.

According to Ayurveda, the knowledge of beauty starts from mother wombs, *Dinacharyā*, *Ratricharyā*, *Ritucharyā* (regimes of day, night and particular season) with the practice of medicinal herbs and minerals. The secret of Ayurvedic cosmetology lies in the surrounding nature. Owing to have Ayurveda as a tradition and life science, Indians use vegetables, fruit, herbals, precious stones, metals, minerals and this let them create unique products which are useful for skin care combined with Ayurvedic massages and cleansing procedures which lead our body and skin to rejuvenation.

Cosmetology is the science of alternation of appearance and modification of beauty.Any substance or preparation intended to be placed in contact with the various external parts of human body like epidermis, hair, nails, and lips, or with the teeth and mucous membrane of oral cavity with a view exclusively or mainly to cleaning them, changing their appearance and/or correcting body odours and or protecting them or keeping them in good conditions can be termed as cosmetic.

Kumārī is one of the non-controversial plant and very popular these days. It is the known drug for wound healing, burns, hepatoprotective and immunomodulator. This plant is seen in every place and almost all the people know about this plant. It has been used to treat various skin conditions such as cuts, burns and eczema. It is alleged that sap from Aloe vera eases pain and reduces inflammation. This may have added benefits when it is used in the preparation of various herbal cosmetics. The main purpose of this review is to reference and validate the literature regarding Ayurveda available in our classical texts as well as modern literature.

Kumārī in Ayurvedic Literature

Nirukti:

"kumārīva. yadvā – kumārayati kumāra kṛīḍāyām"

(amarakośa)

Due to the properties of drug, young girls become healthy enough to play like boys of the same age.

Documentation in texts:

Vedas are foremost ever written documents of knowledge; Kumārī is not traced in Vedas and Brihadtrayee. It firstly appears in Bhela Samhitā in its chikitsā sthāna. The chronology of Ayurvedic textual references of kumārī is as under:

Name of the text	Reference	Documented as
Brihadtrayee	No textual reference of kumari	
Bhela Samhitā (1000 B.C.)	Bhel Samhitā/chikitsā sthāna 25/25	As an ingredient of Rāsnā tail in vāta vyādhi chikitsā
Amarakośa (?6th century A.D.)	Amarakośa / Dwitiya khanḍa / Vanaushadhi Varga / 73)	Under vanauṣadhi varga
Aṣṭāṅga Nighanṭu (8th century A.D.)	Astāṅga Nighanṭu / Viprakirana Varga / 278)	Synonyms mentioned as kumāra, vyāghrcarana, sthūladala, bandhūka, bandhujīva, parvaka, vrikkadhūmaka
Rājamārtanḍa (11th century A.D.)	Rājamārtanḍa 23/3	For external use only
Rasārnava (12th century A.D.)	Rasārnava 5/10	Nirjīva kāraka drug
Dhanvantarī Nighanṭu (10th century A.D.)	Dhanvantarī Nighanṭu / Āmrādi varga / Taruni 147-148	Kumārī as synonym of taruni and kumārika as synonym of vandhyākarkoṭaki and karkoṭaki.
Gadanigraha (12th century A.D.)	Gadanigraha 8/23	Main ingredient of Kumāryāsava
Mādhava Dravya Guna (13th century A.D.)	Mādhava Dravya Guna / Vividha Auṣadhi Varga / 141	Indicated in yakrit roga, plīha roga, kapha roga and jvara
Abhidhānaratnamālā (13th century A.D.)	Abhidhānaratnamālā / Kaṣāya skanda / 82	Synonyms mentioned as kanyā, krikoṭi, vyāghrcaranā
Rasa Ratna Samuccaya (13th century A.D.)	Rasa ratna samuccaya 25/18	Paste of kumārī juice with jīraka has been indicated to pacify the burning sensation and suppuration in lingapāka
Śarangadhara Samhitā (13th century A.D.)	Śarangdhara Samhitā / Madhyama Khanḍa 1/15	With nishā chūrna for plīhā roga and apacī
	Śarangdhara Samhitā / Madhyama Khanḍa 10/15	Kumāryāsava and its uses
Vaidyamanorma (13th century A.D.)		Indicated inmutrakriccha during fever
Madanapāla Nighanṭu (14th century A.D.)	Madanapāla Nighanṭu / Abhyādi Varga / 331-332	Synonyms and uses are mentioned
Kaiyadeva Nighanṭu (15th century A.D.)	Kaiyadeva Nighanṭu / Auṣadhi Varga / 1638-1640	Properties and synonyms of Kumārī along with the indications of its flower as guru, vāta, pitta and kṛimihara are mentioned
Bhāvaprākaśa Nighanṭu (16th century A.D.)	Bhāvaprākaśa Nighanṭu / Guḍucyādi varga / 196-197	Synonyms mentioned as gṛahakanyā, kanyā, ghṛita kumārī, rasa as tikta – madhura and indication as vātahara
Arkaprakāśa (16th century A.D.)	Arkaprakāśa/Netrya gana	Girikanyā's arka is useful in leprosy, pain, wounds and poisoning
Āyurveda Saukhyama (16th century A.D.)	Āyurveda Saukhyama	Included in tikta dravyas
Rāja Nighanṭu (17th century A.D.)	Rāja Nighanṭu / Parpaṭādi Varga / Kumārī / 47-49	Reduces kapha, pitta, kāsa, śwāsa and kuṣṭha
Yoga Ratnākara (17th	Yoga Ratnākara / Gulma	Main ingredient of Kumāryāsava

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century A.D.)	chikitsā / 17	
Bhaiṣajya Ratnāvali (18th century A.D.)		As an ingredient of Vijayādi vaṭi useful in kriccha rajasṛuti (Dysmenorrhoea)
	Bhaiṣajya Ratnāvali / Yonivyāpada chikitsā 67/57-58	As an ingredient of Rajahpravartini vaṭi indicated for amenorrhea and dysmenorrhoea
		Kumārika vaṭi for all type of pains
Śaligrāma Nighanṭu / Guḍucyādi Varga	Śaligrāma Nighanṭu / Guḍucyādi Varga	Synonyms mentioned as kumārī, dīrghapatrikā, aphalā, sursā, kanyā, mṛidughṛitakumārī
		Properties of kumārī stem mentioned as krimihara and pittaghna and its flowers as guru, vātapittahara and krimighana
Āyurveda Vijñanam (19th century A.D.)		Indicated in constipation, kṛimiroga, anxiety, epilepsy, amenorrhea, urticaria, headache, fever, spleen diseases and mandāgni
Siddha Bheṣaja Manimāla (1905 – 1954 A.D.)	Siddha Bheṣaja Manimāla / Apasmāra Chikitsā	Kumārī swarasa in epilepsy and palpitation of heart along with madhuka kwātha in apasmāra chikitsā
Priya Nighanṭu (20th century A.D.)	Priya Nighanṭu/ Śatapuṣpādi Varga	Reduces gulma, plīhavṛiddhi, yakṛitavṛiddhi and rajorodha
Abhidhāna Manjari	Abhidhāna Manjari / Samkīrna varga 1 / Vanavasantī 1052	Mentioned under the name of vanavasantī
Ayurvedic Pharmacopeia of India (1978)	API / Part 1 / Vol 1	Kanyāsāra mentioned as bhedi, pittanirharana, rajahpravartaka, jvaranut
Saraswatī Nighanṭu (21st century A.D.)	Saraswatī Nighanṭu / Ulāpa varga / Kumārī 41	Leaf pulp mentioned as cakṣuṣya, śīta

Kumārī in Modern Literature

Scientific name:

Aloe vera (L.) Burm. Fil.

Synonyms: *Aloe barbadensis* Mill.

Aloe indica

Family:

Asphodelaceae (Liliacaea)

Phytochemistry:

Aloe vera, also known as *Aloebarbadensis* is part of the Liliaceae or Asphodelaceae plant family. It is cactus like plant with green dagger-shaped leaves that are fleshy, tapering, spiny, marginated and filled with a clear viscous gel. It has thick leaves that grow in a rosette shape. Many species of Aloe appear to be stem-less, with the rosette growing directly at ground level; other varieties may have a branched or unbranched stem from which the fleshy leaves spring. They vary in color from grey to bright-green and are sometimes striped or mottled. Its name is most likely derived from the Arabic word "Alloeh", meaning "shining bitter substance".

Aloe vera leaves are rich with 200 active compounds, including 20 minerals, 18 amino acids, 12 vitamins, water and 75 nutrients. Aloe has a high enzyme content (about 92 enzymes) which makes it a rare and valuable resource because enzyme helps the body to absorb basic nutrients while also purifying.

A. vera is reported to contain mono and polysaccharides, tannins, sterols, organic acids, enzymes, saponins, vitamins and minerals. In the GC-MS analysis, 26 bioactive phytochemical compounds are identified in the ethanolic extract of *Aloe vera*.

Skin is the largest organ in the human body. It is exposed to environmental insult of which UV light is

thought to be the most harmful. UV exposure can cause oxidative stress, inflammation, erythema, breakdown of the extracellular matrix, wrinkling as well as skin cancer.In fact, cumulative sun exposure is one of the most important risk factors for both non-melanoma and melanoma skin cancers.

UV light is grouped as UVA (315–400 nm), UVB (280–315 nm) and UVC (220–280 nm), from lowest to highest energy. The Earth's atmosphere filters out UVC light and of the remaining UV light to which we are exposed, 95% is UVA. The primary focus of UV research has been UVB light, but this is shifting toward UVA light. UVA is of higher wavelength which enables it to penetrate deeper into the skin.UVB is mostly absorbed by the epidermal layer, but UVA affects the dermal layer as well. UVA has demonstrated carcinogenicity in animal models, emphasizing the need to understand and prevent the processes by which UVA exerts its biological effects. Clinical changes seen with photoaging, such as roughness, fine wrinkles, spotty hyperpigmentation, vasodilation, and loss of elasticity, are attributed primarily to UVA as well.

Some of the constituents of *aloe* vera have their respective effects on skin described as under:

- **Phytol** (PYT) is a diterpene member of the long-chain unsaturated acyclic alcohols. PYT and some of its derivatives, including phytanic acid (PA), exert a wide range of biological effects. PYT is a valuable essential oil (EO) used as a fragrance and a potential candidate for a broad range of applications in the pharmaceutical and biotechnological industry. Recent investigations with PYT demonstrated anxiolytic, metabolism-modulating, cytotoxic, antioxidant, autophagy- and apoptosis-inducing, antinociceptive, anti-inflammatory, immune-modulating, and antimicrobial effects.
- Because **phytol** and other **isoprenoids** are lipophilic, they are capable of interacting with cell membranes as well as other lipophilic substances and metabolites. This ability makes these compounds suitable for use as immune adjuvants, the outcomes of which may lie in efficient delivery of antigens to antigen-presenting cells, up-regulation of costimulatory molecules and promotion of cellular crosstalk.
- **Phytol**has a non-TPA-type (12-O-tetradecanoylphorbol13-acetate) tumor-promoting activity in addition to its various physiological effects, such as suppression of cell proliferation, induction of inflammation and spasmodic activity.
- The transdermal delivery of the drugs tested from propylene glycol vehicle systems can be significantly increased by adding small amounts of **choline esters** and / or **oleicacid** to the vehicle which act as synergists giving larger enhancement of the transdermal delivery of nitroglycerin and acyclovir than when used separately.
- The unsaturated **oleic** (monoethenoid series), **linoleic** (diethenoid series), and **linolenic** (triethenoid series) fatty acids have been investigated in vitro for their fungistatic activity on *Trichophyton rubrum*. It was found that oleic acid had very slight fungistatic action in a 1:10 concentration; linoleic acid had slight to moderate fungistatic action in concentrations from 1: 1000 to 1:10; linolenic acid had moderate to substantial fungistatic action in concentrations of 1:1000 to 1:10; while undiluted acetone, under the same conditions, did not inhibit growth of the fungus at all.
- **Linoleic acid** inhibits growth by increasing the permeability of the bacterial membrane as a result of its surfactant action.
- Human sebum contains 13% **squalene** as one of its major constituents. **Squalane** is a saturated derivative of squalene and also found in these sources. Several studies exhibited results that prove certain bioactivities for squalene and squalane. Up to date, anticancer, antioxidant, drug carrier, detoxifier, skin hydrating, and emollient activities of these substances have been reported both in animal models and *in vitro* environments.
- Ultraviolet irradiation is capable of affecting skin surface lipids, especially **squalene** and **cholesterol**, both in vitro and in vivo, with generation of active lipoperoxides.

- The effect of **squalene** on superoxide anion (O_2^-) generation was studied in rats in order to elucidate the mechanism whereby the compound decreases erythema induced by 1% lauroylsarcosine (LS) ointment. Topical application of superoxide dismutase (SOD) ointment (99000 U/g) was effective on the erythema as well as 10% squalene ointment, suggesting that $O_2^-$is a major mediator responsible for skin irritation. Squalene had no effects on O_2^-generation in a xanthine-xanthine oxidase system unlike the effect observed with SOD. These results suggest that a possible role of squalene for the alleviation of skin irritation is suppression of O_2^- production depending on the different mechanism of action from SOD.
- In order to investigate whether products derived from the oxidation of sebum can be responsible for the induction of inflammatory processes, Spontaneously Transformed Human Keratinocyte Cell Culture (HaCaT keratinocytes) were treated with peroxidated squalene. An association between LOX stimulation and increased percentage of proinflammatory lipids in acne as well as a correlation between increased cytokine levels in the infundibulum, pilosebaceous duct hyperkeratinization, and augmented sebogenesis, the data further supported the involvement of lipid peroxides, in particular **squalene peroxides**, in establishing an inflammatory process in acne.
- **Vitamin E** is the major naturally occurring lipid-soluble non-enzymatic antioxidant protecting skin from the adverse effects of oxidative stress including photoaging. Its chemistry and its physiological function as a major antioxidative and anti-inflammatory agent, in particular with respect to its photoprotective, antiphotoaging properties, are described by summarizing animal studies, in vivo tests on human skin and biochemical in vitro investigations. Vitamin E occupies a central position as a highly efficient antioxidant, thereby providing possibilities to decrease the frequency and severity of pathological events in the skin.
- Experimental evidence suggests that **topical** and **oral vitamin E** has anti-tumorigenic, photo-protective, and skin barrier stabilizing properties. Topical admistration of antioxidant mixtures containing vitamin E might be particularly promising as adjuncts to modern sunscreens. While the current use of vitamin E is largely limited to cosmetics, controlled clinical studies for indications such as atopic dermatitis or preventions of photo-carcinogenesis are needed to evaluate the clinical benefit of vitamin E.
- Skin plays an important role in protection against oxidative stressors such as ultraviolet radiation, ozone and chemicals. Chronic sun exposure causes degenerative changes in the skin that are recognized as photo-ageing. Oxidative stress has been shown to alter the expression of mammalian antioxidant enzymes as well as to enhance numerous transcription factors, including nuclear factor κB, stress-activated protein kinase and heat shock factor. Exogenous antioxidant supplementation with **vitamin E** could have cosmetic benefits and may be an efficient tool to mitigate the consequences of free radical-induced skin damage.
- The compound **β-sitosterol** (BS) is one of the most common forms of phytosterols and has anti-cancer, anti-oxidant, anti-bacterial, and anti-inflammatory effects.In the stimulated human mast cell line (HMC-1 cells), increased intracellular calcium levels were decreased by treatment with BS. Further, BS inhibited the production and mRNA expression of TSLP (Thymic stromal lymphopoietin) through blocking of caspase-1 and nuclear factor-κB signal pathways in the stimulated HMC-1 cells. These results provide evidence that BS may be considered an effective therapeutic drug for the treatment of Atopic Dermatitis.
- Moist exposed burn ointment (MEBO) is an example of an alternative remedy proposed in the management of burn injuries. MEBO is a petrolatum-based ointment containing sesame oil, **β-sitosterol**, berberine and other plant ingredients. The precise mechanism of action is not fully understood but it is surmised that the oil-based ointment

provides a moist environment encouraging epithelial regeneration; moreover, β - sitosterol provides some anti-inflammatory effects.

- **Lupeol** facilitates a number of responses relevant to chemoprevention. A wide range of studies have shown that several naturally occurring compounds possess significant anti-tumour promoting activity due to their anti-oxidant nature. Lupeol attributes its chemopreventive property to its dual character i.e. its anti-oxidant nature and its potential to reverse the activity of phase II enzymes that may be depleted with the exposure of tumour promoters.
- The skin permeation enhancement effects were studied using human stratum corneum and p-aminobenzoic acid (PABA) as a model permeant. Short chain fatty acids with 6 to 12 carbons exhibit a parabolic correlation between enhancement effect and chain-length, with a maximum at nonanoic-decanoic acids (with 9 and 10 carbons). **Nonanoic** and **decanoicacids** exert barely noticeable effects on the thermal behaviour of stratum corneum, suggesting that they easily mix with the skin lipids. All **cis-6-, 9-, 11- or 13-octadecenoic acids** (Mono unsaturated fatty acid i.e. **MUFA**) enhance the permeation of PABA to the same extent. Poly unsaturated fatty acids (**PUFA**)—linoleic (LA), α-linolenic (ALA) and arachidonic acids—enhance PABA permeation stronger than MUFA but additional double bonds do not further increase the degree of enhancement. The enhancement effects of fatty acids on the PABA penetration through stratum corneum are structure-dependent, associated with the existence of a balance between the permeability of pure fatty acids across SC and the interaction of the acids to skin lipids.
- **Barbaloin** is C-glucoside of aloe emodin anthrone which is found in the plant name as *Aloe vera* is a perennial succulent, also called the healing plant. Barbaloin have variety of pharmacological activity such as strong inhibitory effect on histamine release, anti-inflammatory, cathartic, antiviral, antimicrobial, anticancer, antioxidant activity and alternative for pharmaceutical or cosmetic applications.

The amount of water in the gel fluctuates between 98.5% and 99.5% of fresh weight, while more than 60% of the remaining gel consists of polysaccharides. To process the leaf, its products are separated into gel and cortex. The latex is in the cortex and corresponds to the bitter yellow juice of the green part of the leaf produced in the leaf epidermis and in the spiny portion of the leaves. The bitter juice contains hydroxyanthracene derivatives (15-40%). Aloe gel is the colourless mucilage within the inner part of the fresh leaves and consists primarily of water (>98%) and polysaccharides (pectins, cellulose, hemicellulose and an acetylated galactoglucomannan called acemannan).

EFFECTS

Aloe vera contains vitamin B complex, folic acid, vitamin C and carotene, which is a precursor of vitamin A. Aloe vera leaf juice is commonly used in cosmetic formulations, and is composed of mainly water, along with polysaccharides, anthraquinones, amino acids, glycosides, minerals, flavones, phytosterols and salicylic acid.

- **Polysaccharides** give aloe its hydrating, emollient and anti-inflammatory benefits, while creating a protective barrier on the skin.
- Aloe contains a large number of **anthraquinones**, which offer antimicrobial and antioxidant characteristics.
- **Flavones** offer further protection from free-radical damage. Individual flavonoids compounds have been reported to be radical scavengers, UVA absorbent, cytoprotective, anti-inflammatory anti-apoptotic, and to inhibit DNA damage and to affect cellular signaling pathways.
- **Phytosterols** are anti-inflammatory, which calm and soothe itchy skin, also moisturizing and protecting the skin from trans-epidermal water loss.
- **Glycosides** promote healthy cell regeneration and offer antihistaminic (anti-allergen) properties, while vitamins,

minerals and essential amino acids nourish the skin.

Mechanism of actions

1. ***Healing properties*:**Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral *aloe vera*. Aloe gel not only increased collagen content of the wound but also changed collagen composition (more type III) and increased the degree of collagen cross linking. Due to this, it accelerated wound contraction and increased the breaking strength of resulting scar tissue.An increased synthesis of hyaluronic acid and dermatan sulfate in the granulation tissue of a healing wound following oral or topical treatment has been reported.
2. ***Effects on skin exposure to UV and gamma radiation:****Aloe vera* gel has been reported to have a protective effect against radiation damage to the skin.Exact role is not known, but following the administration of aloe vera gel, an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10 (IL-10) and hence prevents UV-induced suppression of delayed type hypersensitivity.
3. ***Anti-inflammatory action:****Aloe vera* inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts.
4. ***Effects on the immune system:*** Alprogen inhibit calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of histamine and leukotriene from mast cells. In a study on mice that had previously been implanted with murine sarcoma cells, acemannan stimulates the synthesis and release of interleukin-1 (IL-1) and tumor necrosis factor from macrophages in mice, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells. Several low-molecular-weight compounds are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils.
5. ***Anti-viral and anti-tumor activity:*** These actions may be due to indirect or direct effects. Indirect effect is due to stimulation of the immune system and direct effect is due to anthraquinones. The anthraquinone aloin inactivates various enveloped viruses such as herpes simplex, varicella zoster and influenza. In recent studies, a polysaccharide fraction has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the formation of potentially cancer-initiating benzopyrene-DNA adducts. An induction of glutathione S-transferase and an inhibition of the tumor-promoting effects of phorbol myristic acetate has also been reported which suggest a possible benefit of using aloe gel in cancer chemoprevention.
6. ***Moisturizing and anti-aging effect:*** Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores. Its moisturizing effects has also been studied in treatment of dry skin associated with occupational exposure where *aloe vera* gel gloves improved the skin integrity, decreases appearance of fine wrinkle and decreases erythema. It also has anti-acne effect.
7. ***Antiseptic effect:****Aloe vera* contains 6 antiseptic agents: Lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and viruses.

Side effects

Topical: It may cause redness, burning, stinging sensation and rarely generalized dermatitis in sensitive individuals. Allergic reactions are mostly due to anthraquinones, such as aloin and barbaloin. It is best to apply it to a small area first to test for possible allergic reaction.

Oral: Abdominal cramps, diarrhea, red urine, hepatitis, dependency or worsening of constipation. Prolonged use has been reported to increase the risk of colorectal cancer. Laxative effect may cause electrolyte imbalances (low potassium levels).

Contra-indications: Contraindicated in cases of known allergy to plants in the Liliaceae family.

Pregnancy and breastfeeding: Oral aloe is not recommended during pregnancy due to theoretical stimulation of uterine contractions, and in breastfeeding mothers, it may sometime causes gastrointestinal distress in the nursing infant.

Interactions: Application of aloe to skin may increase the absorption of steroid creams such as hydrocortisone. It reduces the effectiveness and may increases the adverse effects of digoxin and digitoxin, due to its potassium lowering effect. Combined use of *Aloe vera* and furosemide may increase the risk of potassium depletion. It decreases the blood sugar levels and thus may interact with oral hypoglycemic drugs and insulin.

DISCUSSION

Today, components of *aloe vera* plant are widely used in medicinal applications such as healing wounds, in cosmetics and as nutraceuticals (prebiotics). The analyses of*aloe vera* indicate its nutritional and phytochemical composition. The proximate analysis shows a high level of carbohydrate and crude fibre with a little bit of protein. The mineral analysis indicates that *Aloe vera* contain macro/major elements which are needed in high quantity in meals, potassium been the highest. Sodium and magnesium are also found to be abundant in this plant. Micro elements are also found to be present. These are all good indication of high nutritive value. Despite the presence of some anti-nutrient that could serve as mineral inhibitors, *Aloe vera* can still be used as sources of these minerals. The phytochemical content also is an indication that this sample has potential protective effects against degenerative diseases.

Thus, though *Aloe vera* has wide spectrum of the properties and uses, some of them could be myths and some of them could be real magic. In future, controlled studies are required to prove the effectiveness of *Aloe vera* under various conditions.

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