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4**A short review of the incredible therapeutic plant, *Aloe vera***Ashutosh Pathak*^{1,2}, Neetu Soni¹, Adaya Raj Panday³¹Department of Pharmaceutical Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh - 211007, India.²Institute of Pharmacy, Dr. Shakuntala Misra National Rehabilitation University, Mohan Rd, Sarosa Bharosa, Lucknow, Uttar Pradesh – 226017, India.³Department of Pharmaceutical Sciences, Babasaheb Bhimrao Ambedkar University, A Central University, Lucknow, India.

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ABSTRACT: *Aloe vera* is widely recognized for having several therapeutic benefits. One of the most abundant natural sources of health for humans is this plant. The chemical composition of the plant has been shown to have over 200 distinct physiologically active compounds. The inner gel of the leaves is responsible for several of the biological characteristics of *Aloe* species. The majority of studies have targeted over the biological activities of the many species of *aloe*, particularly the nonvolatile components of the leaf gel's antibacterial and antimicrobial properties. *Aloe* species are found practically everywhere in the world, with a large distribution in Africa and Eastern Europe. *A. vera* possesses many therapeutic qualities, including anti-tumor, antiarthritic, anti-rheumatoid, anticancer, and hypoglycemic effects. Furthermore, *A. vera* has been advocated as a treatment for immune system deficits, gastrointestinal issues, and constipation. However, there isn't enough solid information on the gel's characteristics at this time. This review focuses on the precise chemical makeup of *aloe* gel and its different phytocomposites.

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INTRODUCTION:

Aloe vera is one of the many succulent plants praised for its many therapeutic uses. This amazing plant has captivated humans for ages due to its numerous therapeutic applications, from ancient civilizations to modern health enthusiasts. This study looks at the pharmacological characteristics, medicinal uses, and biochemical composition of *aloe vera* to support any possible health advantages ^[1-5]. Greece, Egypt, India, Mexico, Japan, and China are among the countries that have long utilized *aloe vera* for medicinal purposes. Nefertiti and Cleopatra, the queens of Egypt, used it in their daily beauty regimens. It was used to heal the

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wounds of soldiers by both Christopher Columbus and Alexander the Great. When John Good Yew translated Dioscorea's' De Materia Medica into English in 1655, aloe vera was first mentioned. Aloe vera was being used as a laxative in the United States by the early 1800s, but when it was discovered to be a successful treatment for severe and chronic radiation dermatitis in the mid-1930s, the field underwent a paradigm shift ^[5-10]. *Aloe vera*, scientifically known as *Aloe barbadensis* Miller, belongs to the *Asphodelaceae* family of plants, which was formerly known as the *Liliaceae* family. This adaptive plant is shrubby or arborescent because of its succulent leaves, xerophytic adaptations, perennial habit, and stunning pea-green color. It grows well in dry environments and is native to desert regions of America, Europe, Asia, and Africa. Gujarat, Maharashtra, Tamil Nadu, Rajasthan, and Andhra Pradesh are among the Indian states where aloe vera grows well. Because of its many uses and health advantages, this plant has been valued as a rich botanical resource for millennia, spanning multiple civilizations ^[11-16].



Fig 1. The *Aloe vera* plant.

Table 1. *Aloe vera* categorization.

Kingdom	Plantae
Kingdom	Plantae
<i>Clade</i>	Tracheophytes
<i>Clade</i>	Angiosperms
<i>Clade</i>	Monocots
Order	Asparagales
Family	Asphodelaceae
Subfamily	Asphodeloideae
Tribe	Aloecae
Genus	<i>Aloe</i>

Table 2. Some of the important accepted species (Approx. 600) of *Aloe vera*.

<i>A. aculeata</i> Pole-Evans	<i>A. africana</i> Mill	<i>A. albida</i> (Stapf) Reynolds
<i>A. polyphylla</i> Pillans	<i>A. reynoldsii</i> Letty	<i>A. peglerae</i> Schönland
<i>A. arborescens</i> Mill	<i>A. albiflora</i> Guillaumin	<i>A. bakeri</i> Scott-Elliot
<i>A. buettneri</i> A.Berger	<i>A. arenicola</i> Reynolds	<i>A. argenticauda</i> Merxm. and Giess
<i>A. ferox</i> Mill	<i>A. cooperi</i> Baker	<i>A. dewinteri</i> Giess ex Borman and Hardy
<i>A. brevifolia</i> Mill	<i>A. forbesii</i> Balf.f.	<i>A. jawiyon</i> S.J.Christie
<i>A. inyangensis</i> Christian	<i>A. erinacea</i> D.S.Hardy	<i>A. hereroensis</i> Engl
<i>A. broomii</i> Schönland	<i>A. helenae</i> Danguy	<i>A. capitata</i> Baker
<i>A. comosa</i> Marloth and A.Berger	<i>A. camperi</i> Schweinf	<i>A. excelsa</i> A.Berger
D.P.Hannon and Oakman ex A.G.Mill	<i>Aloe wildii</i>	<i>Aloe succotrina</i> Lam

BIOLOGICAL COMPOSITION:

Bioactive components found in aloe vera including:

- Polysaccharides
- Glycoproteins
- Vitamins
- Minerals
- Antioxidants.
- Its anti-inflammatory qualities are attributed to glycoproteins such aloein A and B, while the polysaccharides, most notably acemannan, demonstrate immunomodulatory activities. Furthermore, vitamins C and E, in addition to minerals like zinc and selenium, have antioxidant properties that protect cells from damage caused by oxidation ^[17].

PHARMACOLOGICAL ACTIONS:

Aloe vera's medicinal qualities cover a wide range of therapeutic outcomes. Its well-established anti-inflammatory qualities are linked to the suppression of digestive enzymes and cytokines that promote inflammation. The extract of aloe also has antibacterial action towards a range of diseases, such as pathogenic fungi, viruses, and bacteria. Substances like saponins and anthraquinones aid in this antibacterial effect. *Aloe vera* also promotes collagen production and angiogenesis, which speeds up the regeneration of tissue and has wound-healing capabilities ^[18-22].

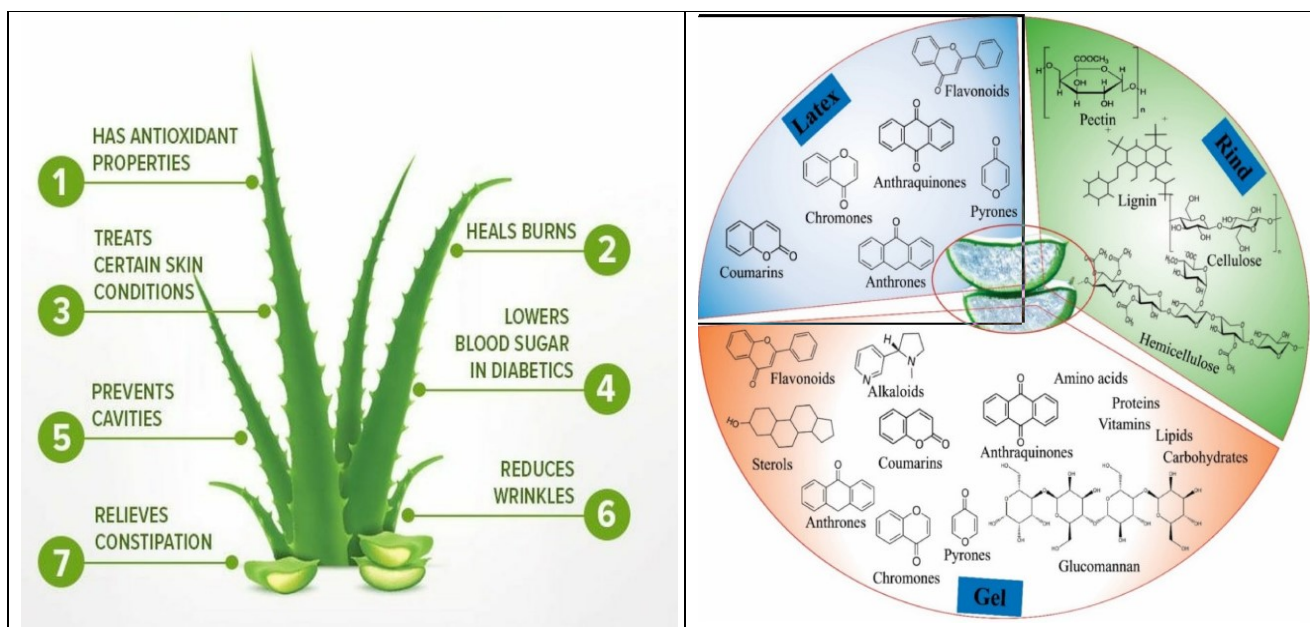


Fig 2. The phytoconstituents present and Pharmacological activities of *Aloe vera*.

APPLICATIONS IN CLINICAL PRACTICE:

Numerous skin diseases, such as burns, wounds, psoriasis, and acne, can be effectively treated using aloe vera in dermatology. It is a well-liked component in skincare products because of its emollient and moisturizing characteristics. Because of its anti-inflammatory and antibacterial properties, aloe vera is often used in dentistry to support oral health. Aloe vera juice is ingested internally for presumed gastrointestinal properties, including relief from constipation and enhanced digestion. Additional study is necessary to fully understand the benefits of these preliminary trials, which also point to possible uses in the management of diabetes, lowering of cholesterol, and improving immunological function [22-30].

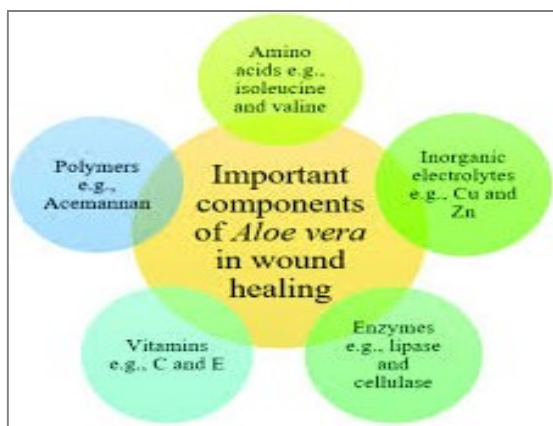


Fig 3. The important components of *Aloe vera* in wound healing.

CHEMICAL CONSTITUENTS [30-36]:

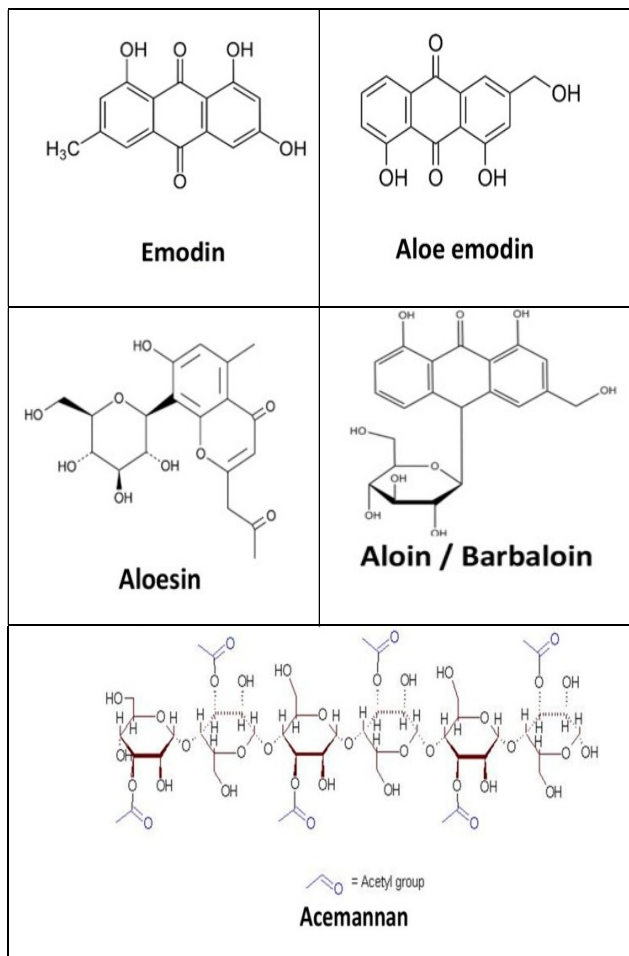




Fig 4. The Chemicals present in *Aloe vera* [36-38].






Table 3. The chemical constituents of *Aloe vera* and their biological properties.




Chemical Constituents	Examples	Biological activity (Uses)
polysaccharides	<ul style="list-style-type: none"> ➤ Acemannan ➤ Monosaccharides such as mannose-6-phosphate ➤ Polysaccharides such as (glucomannans/polymannose) and monosaccharides (glucose and fructose). ➤ beta-(1,4)-acetylated mannan, are the most prevalent polysaccharides. 	<ul style="list-style-type: none"> ➤ Via increasing the expression of IL-6 and IL-8 and NF-Kβ/DNA binding (human gingival fibroblasts), they have immunomodulatory agents and anti-inflammatory effects. ➤ Also used in wound healing and tissue repair. ➤ Boost the expression of the IκB-alpha protein ➤ HaCaT cell defence against psoriasis. ➤ Reduced quantity of β-cell apoptosis. ➤ Relief is provided for stress related to endoplasmic reticulum communication.
Anthraquinones Derivatives of anthraquinones Phenolic compounds Pyrones and Chromones	<ul style="list-style-type: none"> ➤ Aloin ➤ Aloe-emodin ➤ Aloesin ➤ Emodin 	<ul style="list-style-type: none"> ➤ Have a laxative effect ➤ Facilitate digestion ➤ Encourage cell migration ➤ Increased wound healing ➤ Decreased cell proliferation ➤ Increased differentiation; ➤ Increased transglutaminase transamination activity ➤ Increased dabrafenib antiproliferative activity ➤ Decreased phosphorylation of akt and erk ➤ decreased number of cells in the s phase (te1 cancer cells) ➤ Increased mitotic death ➤ Decreased mitotic index; decreased g2/m phase ➤ Ros generation ➤ Increased potential of the mitochondrial membrane ➤ Increased antioxidant activity ➤ Increased scavenging of peroxy radicals. ➤ Diminishing capability ➤ Increased Expression of caspase-3, caspase-9, and caspase-12 ➤ Elevated Cytochrome C liberation ➤ Build-up of cartilage nodules ➤ Synthesis of matrix proteoglycans ➤ \uparrow ALP engagement ➤ \uparrow Markers for chondrogenesis ➤ \uparrow ERKs ➤ ATDC5 cells exhibit BMP-2 protein expression. (Cardioprotective Effect)
Enzymes	<ul style="list-style-type: none"> ➤ Amylase ➤ Lipase ➤ Bradykinase ➤ Catalase ➤ peroxidase 	<ul style="list-style-type: none"> ➤ Digestion ➤ reduce inflammation ➤ promote healing
Vitamins	<ul style="list-style-type: none"> ➤ Vitamin A (beta-carotene) ➤ Vitamin C ➤ Vitamin E ➤ Vitamin B1, B2, B6 and B12 ➤ Folic acid, and choline 	<ul style="list-style-type: none"> ➤ Antioxidant properties ➤ Protecting cells from damage caused by free radicals ➤ Protect the body by neutralizing free radicals
Amino Acids	Aloe vera contains 20 of the 22 essential	They are the building blocks of proteins and are

	amino acids needed by the human body.	involved in various metabolic processes
Minerals	<ul style="list-style-type: none"> ➤ Calcium ➤ Chromium ➤ Copper ➤ Selenium ➤ Magnesium ➤ Manganese ➤ Potassium ➤ Sodium ➤ Zinc 	<ul style="list-style-type: none"> ➤ Bone health ➤ Immune function ➤ Antioxidant activity ➤ Defence and cosmetologically ➤ Also uses a beauty product ➤ Some of the minerals are essential for the proper functioning of various enzyme systems in different metabolic pathways and few acts as antioxidants.
Saponins	<ul style="list-style-type: none"> ➤ Saponins 	<i>Aloe vera</i> have antimicrobial properties and help in cleansing and detoxifying the body.
Hormones	<ul style="list-style-type: none"> ➤ Auxins ➤ Gibberellins 	Plant Growth hormones
Sterols	<ul style="list-style-type: none"> ➤ Beta-sitosterol 	Anti-inflammatory properties and may help in lowering cholesterol levels.
Glycoproteins	<ul style="list-style-type: none"> ➤ Glycoproteins 	Anti-inflammatory effects and promote wound healing by stimulating the immune system and reducing pain and inflammation
salicylic acid	<ul style="list-style-type: none"> ➤ Salicylic acid 	Which has anti-inflammatory and antibacterial properties. It helps in treating acne and other skin conditions
Fatty acids	<ul style="list-style-type: none"> ➤ Lupeol ➤ Campesterol 	

Table 4. The marketed herbal product of *Aloe vera* [41-44].

Product	Brand	Uses
 <p>Pure aloe gel</p>	Kapiva	<ul style="list-style-type: none"> ➤ Pure aloe vera gel helps fight acne. ➤ Uses in pimples and wrinkles. ➤ It gently hydrates and moisturizes the dry skin. ➤ It is also suitable for oily skin. ➤ It controls excess oil production. ➤ Applying this gel on sunburns, red spots and skin allergies. ➤ Helps provide a soothing effect. ➤ It helps in hair growth and acts as a hair conditioner. ➤ Acts as a moisturizer, hydrating gel. ➤ Soothing gel. ➤ After shave gel. ➤ Face mask for brighter skin. ➤ Eye mask cooling gel for dark circles. ➤ Wrinkles and thus can be used by both women and men.
 <p>Super Nature Potent Aloe Gentle moisture Shampoo</p>	Super nature	<ul style="list-style-type: none"> ➤ Natural aloe is also used in crafting shampoos. ➤ Helps in cleansing the scalp. ➤ Reduces stripping. ➤ Eliminates dryness. ➤ Aloe helps in gaining silky, healthy and lustrous hairs ➤ Powdered aloe juice made from fresh aloe plants is used as an extract of <i>Aloe barbasensis</i>.

 <p>Super Nature Potent Aloe Gentle Moisture Conditioner</p>	<p>Super nature</p>	<ul style="list-style-type: none"> ➤ The conditioner contains potent aloe. ➤ It gently nourishes and infuses moisture within the hairs which are soft, healthy, and protected from damage.
 <p>Aloe vera juice</p>	<p>Patanjali</p>	<ul style="list-style-type: none"> ➤ An ayurvedic proprietary medicine Take 15 to 25 ml twice daily with equal quantity of water. ➤ Useful for constipation Useful for skin diseases.
 <p>Facial Mask (Aloe Vera, Berries, Cucumber, Herbs, Lemon, Papaya)</p>	<p>Mirabelle cosmetics</p>	<ul style="list-style-type: none"> ➤ Calms Sunburned Skin: It soothes and repairs injured skin, minimizing redness and pain. ➤ It leaves skin feeling incredibly hydrated and moisturized. ➤ it improves the skin and highlights a more radiant, balanced complexion. ➤ Minimizes Skin Damage and Aging: Prevents premature aging indications and maintains the appearance of healthy skin.
 <p>Elovera Moisturising Cream</p>	<p>Glenmark</p>	<ul style="list-style-type: none"> ➤ Elovera Moisturizing Cream contains a powerful combination of substances, which includes paraffin with allantoin to manage skin health by providing a protective layer, vitamin E for moisturizing and protection. ➤ Aloe vera for rehydration and improved moisture retention, and glycerine for moisture retention. ➤ Deeply Nourishing Hydration: For a better complexion, Elovera Moisturizing Cream provides deep nourishment, rehydrates the skin, and increases moisture retention. ➤ Scar Removal and Dark Spot Lightening: Elovera Moisturizing Cream lightens stretch marks, minimizes inflammation, and efficiently removes scars and dark spots left behind after pimples, leaving skin smoother and clearer.
 <p>Honey Crème Aloe Vera Hair Removal Body Wax</p>	<p>Sterling Natural s</p>	<ul style="list-style-type: none"> ➤ Aloe and honey both are most common and prominent ingredients of body wax.

 <p>Amla Aloe Vera Wheat-Grass, Haldi and Tulsi Juice</p>	<p>Krishna's herbal and ayurveda</p>	<ul style="list-style-type: none"> ➤ Blessed with the health advantages of five natural components, Krishna's Aloe vera Amla blend with wheatgrass, haldi, and tulsi juice can help fight most of our daily ailments. ➤ Aids in the relief of acidity, indigestion, and constipation. ➤ This juice helps you stay active and fit by preserving the nutritional elements included in the components. ➤ It uses the beneficial properties of aloe vera, amla, wheat grass, haldi, and tulsi to assist remove any impurities from your internal organs. Use two times a day as directed: Empty stomach in the morning (30 ml) and in the evening (30 ml), one hour after meals.
 <p>Orange Aloe and 2% Salicylic Acid Face Serum</p>	<p>Aloe and Me</p>	<ul style="list-style-type: none"> ➤ Aloe Attacks Acne and Acne Marks: The potent exfoliant 2 % salicylic acid reduces excessive sebum production in the pores. ➤ It functions as a strong component to lessen current acne and pimples and stop new breakouts. ➤ Unclogs Pores: aloe's anti-inflammatory and oil-soluble characteristics enable it to deeply enter pores to remove blockages. ➤ Removal of Blackheads - clinically proved to function quickly penetrates the pore lining and removes dirt, debris, and sebum, leaving skin looking clear and soft.
 <p>Aloe Gentle Face Wash with Aloe Vera and Glycerin for Sensitive Skin, Dry to Normal Skin</p>	<p>Mama earth</p>	<ul style="list-style-type: none"> ➤ Gently Cleanses. ➤ Helps in preventing dryness. ➤ Hydrates and Soothes Skin-Enriched with soothing and hydrating properties of Aloe Vera ➤ helps removing oil and impurities while hydrating your skin. Also infused with Glycerin, the face wash helps lock in moisture.

CONCLUSION:

To conclude *Aloe vera* is versatile in many areas as a medicinal plant. Valuable health and wellness asset - with anti-inflammatory, antimicrobial action, wound-healing properties due to its biochemical richness. Recent studies have surfaced modern day uses for the natural herb, which has been relied on and known globally over melodies: thousands of years, hundreds of traditional uses - but it was not until now we know more. Yet still new being discovered because its effects in medicine yield surprises while looking only plain bizarre

to old practice. Aloe vera is, as we strengthen the use and blessings of this haunting process in nature's richest gifts for assistance, it stands an emblem of what now-nature can help us heal.

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