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Application of Aloe vera in Pharmaceutical Products

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Abstract: Ayurvedic, homeopathic, and allopathic medicine all recognize the versatile benefits of the aloe vera plant, which is highly valued not only for its medicinal properties but also as a dietary supplement. The aloe vera plant, particularly its nutrient-rich juice and leaves, contains a wide array of essential components such as vitamins, minerals, enzymes, amino acids, and natural sugars, all of which work synergistically to provide multiple health benefits. These bioactive compounds exhibit a broad spectrum of beneficial effects, including antimicrobial, anti-inflammatory, and antioxidant properties, as well as aphrodisiac, emollient, purgative, and anti-helminthic properties. Moreover, aloe vera is known for its antifungal, antiseptic, and cosmetic properties, primarily targeting the skin to alleviate issues ranging from sunburns and burns to acne and even skin cancer. In addition to promoting skin health and a more youthful appearance, aloe vera juice is acclaimed for its potent laxative effect when consumed internally. Beyond its topical and internal uses, aloe vera is harnessed in Ayurvedic practices as a powerful detoxifier and immune-booster, with traditional texts citing its effectiveness in treating various illnesses like fever, colic, indigestion, worm infestation, splenomegaly, and liver disorders.

Keywords: Aloe Vera, Ulcer, Antibacterial, Wound Healing, Anti-Inflammatory.

Review Paper

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1. INTRODUCTION

The Aloe vera, a succulent known for its soothing and therapeutic qualities, boasts a rich history of use spanning centuries across health, medicinal, and cosmetic applications, particularly in skincare. Its botanical classification firmly places it within the plant kingdom with the following hierarchical structure: Kingdom: Plantae; Order: Asparagales; Family: Asphodelaceae; Genus: Aloe; and Species: Aloe vera. Its taxonomic history is further reflected in Aloe barbadensis Mill., Aloe indica Royle, Aloe perfoliat Linn. var Vera, and Aloe vulgaris Lam. While the majority of Aloe species are non-toxic, it's essential to note that a select few varieties are extremely poisonous, highlighting the importance of proper identification and handling [1].

Traditionally, Aloe vera has been revered for a wide array of purported benefits. Its properties include antibacterial, moisturizing, antitumor, antiviral, laxative, ultraviolet (UV) protection, and wound-healing capabilities. However, as scientific inquiry into the use of Aloe vera expands, research findings increasingly present contradictory results regarding its efficacy. This ambiguity is compounded by our limited understanding of the plant's complex biochemical composition and the intricate mechanisms of action involved. Consequently, intensified scientific investigations are underway to elucidate these aspects. Despite these efforts, the outcomes of these studies have often been inconsistent, suggesting that the observed effects may stem from the synergistic interaction of multiple active components within the plant rather than the contribution of a single, isolated biochemical compound. Therefore, this review will focus on identifying and characterizing the active ingredients of Aloe vera, as well as their respective mechanisms of action, within well-researched areas such as antibacterial activity, anti-inflammatory effects, wound healing promotion, and its impact on diabetes [2].

2. Pharmaceutical Applications of Aloe Vera

Figure 1 revealed the applications of Aloe vera in pharmacy and pharmaceutical industries that discussed in details below.

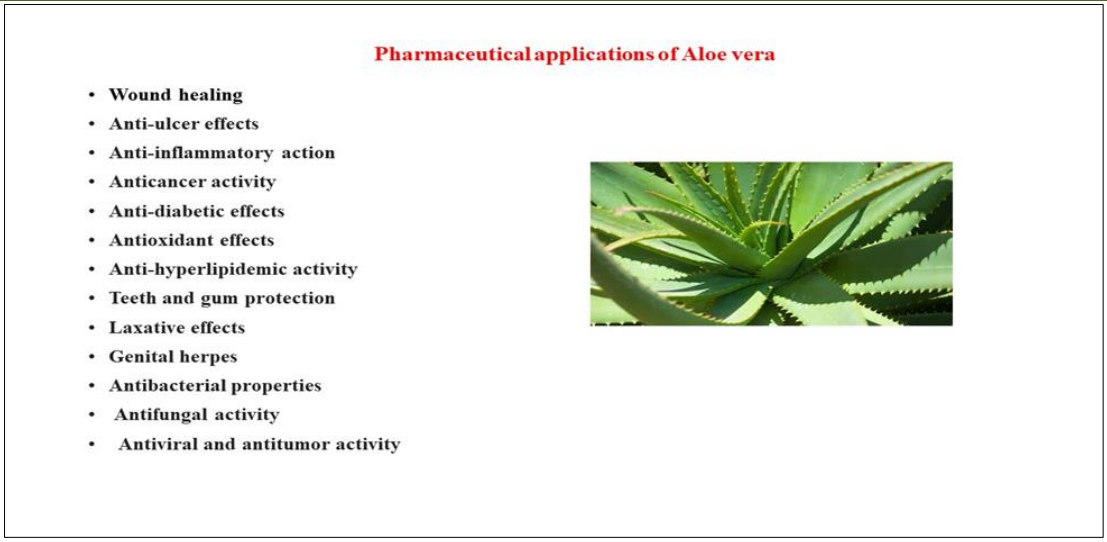

Figure 1: The pharmaceutical applications of Aloe vera

2.1. Wound Healing

Moreover, inorganic electrolytes such as iron, potassium, magnesium, chromium, copper, sodium, calcium, and zinc are essential components in the intricate wound-healing process. These electrolytes play a crucial role in initiating the healing cascade by releasing growth factors, signaling molecules that stimulate cell proliferation, migration, and differentiation. Additionally, these electrolytes encourage the body to create antibodies, bolstering the immune response and preventing infection [3]. Evidence from numerous studies suggests that treatment with *Aloe vera* can significantly promote rapid wound healing and inhibit the formation of unsightly and potentially debilitating scars [4, 5]. This makes *Aloe vera* a promising natural remedy for wound management.

2.2 Anti-Ulcer Effects

Aloe vera juice's anti-inflammatory, wound-healing, mucus-stimulating, and gastric secretion-regulating characteristics assist avoid and cure stomach ulcers. Additionally, it can effectively treat cold sores, leg ulcers, mouth ulcers, and skin ulcers [6].

2.3 Anti-Inflammatory Action

The inclusion of chromone and anthraquinones enhances aloe vera's anti-inflammatory properties. Consequently, it lessens the extent of the wound and the intensity of the pain. It also aids in the relief of joint discomfort. Aloe vera's anti-bradykinin activity lowers inflammation and is more effective against inflammation brought on by prostaglandin generation and leukocyte infiltration than it is against inflammation brought on by allergenic substances. [7].

2.4 Anticancer Activity

Aloe vera's glycoproteins and polysaccharides are effective against a variety of malignancies [9], and they boost the immune system's ability to combat cancerous cells [10].

2.5 Anti-Diabetic Action

Aloe vera gel works well as an anti-hyperglycemic medication for people with type 2 diabetes. It reduces blood glucose levels without interfering with normal liver or renal function or blood lipid levels. Diabetes mellitus can be prevented and cured in a variety of ways. For instance, raising metabolism, lowering oxidative stress, and enhancing antioxidant state [11].

2.6 Antioxidant Effects

Antioxidant vitamins A, C, and E are found in aloe vera gel [12]. Aloe vera gel's ability to shield kidney epithelial cells from dihydrochloride-induced oxidative stress and cell death has been scientifically demonstrated in earlier studies [13].

2.7 Anti-Hyperlipidemic Activity

Triglycerides, LDL cholesterol, and blood cholesterol were all successfully lowered with aloe vera gel [14]. Aloe vera gel and the probiotic lactobacillus rhamnosus have been shown in earlier studies to improve lipid profiles in hypercholesteremic rats and increase the generation and absorption of cholesterol, which lowers the risk of cardiovascular illnesses [15].

2.8 Teeth and Gum Protection

After periodontal flap surgery, aloe vera is frequently used to reduce pain and promote and accelerate healing. Aloe vera is used to treat gingivitis and periodontitis by reducing bleeding, controlling inflammation, and halting gum swelling [16].

2.9 Laxative

Aloe vera gel has a long history of traditional use as a remedy for constipation, primarily due to the

presence of laxative compounds within the plant. Specifically, anthraquinones found in the latex of the aloe vera plant are potent laxatives. Their mechanism of action involves several key processes within the digestive system. These compounds increase water content in the intestines, which softens the stool and makes it easier to pass. Furthermore, anthraquinones stimulate the secretion of mucus in the intestinal lining, further aiding in the lubrication and movement of fecal matter. Finally, they enhance intestinal peristalsis, the rhythmic contractions of intestinal muscles that propel waste through the digestive tract. Previous research has indicated that even relatively small doses of anthraquinones, such as 0.25mg, can elicit laxative effects within 6 to 12 hours after ingestion, typically resulting in loose bowel movements [17]. This suggests that aloe vera gel can be an effective, albeit potentially powerful, remedy for constipation.

2.10 Genital Herpes

Treatment for genital herpes focuses on managing symptoms and preventing future outbreaks. Antiviral medications are commonly prescribed to speed up the healing of sores and lesions during an outbreak, as well as to reduce the frequency and severity of future occurrences. Beyond conventional medications, some research suggests alternative therapies may offer benefits. For example, a study revealed topically employing of its extract, and formulated as a hydrophilic cream, can be effective in treating genital herpes in men by promoting a faster healing process of the lesions. This highlights the potential of natural remedies as adjunctive or alternative treatments for managing genital herpes [18].

2.11 Antibacterial Properties

Aloe vera gel has been shown in numerous studies to suppress the growth of some germs, such as Streptomyces, Shigella, and Klebsiella, particularly Gram-positive bacteria that cause food poisoning or other illnesses in both people and animals [20].

2.12 Antifungal Action

Antifungal action against various species of Candida has been proved in numerous studies, highlighting the effectiveness of certain natural substances in combating these fungal infections. In particular, Aloe vera, a widely recognized plant known for its healing properties, is valued not only for its health benefits when applied topically or ingested but also for its antifungal properties, which make it an excellent choice to be utilized as a water conditioner for fish tanks. This use of Aloe vera helps maintain a healthy aquatic environment, supporting the well-being of fish by preventing the growth of harmful fungi and ensuring the overall quality of the tank water [20].

2.13 Antiviral and Antitumor Activity

The actions described can be categorized in two distinct ways: as either indirect effects or direct effects. The indirect effects manifest primarily via the immune system stimulating, enhancing its overall functionality and responsiveness. Conversely, the direct effects specifically relate to the presence and activity of Anthraquinones, which interact with biological systems in a more immediate and observable manner. It is important to ensure that all content adheres to guidelines that prohibit the creation or sharing of any material involving inappropriate themes, such as sexual content, profanity, hate speech, or violence. Additionally, one must avoid topics related to sensitive events, and steering clear of dangerous products, as well as the promotion or misuse of substances like marijuana, tobacco, and alcohol, is essential [20].

3. CONCLUSION

Aloe vera, a versatile plant renowned for its multitude of uses, is widely employed in the fields of Pharmaceuticals. The applications of Aloe vera products are incredibly beneficial, offering users a natural and safe alternative for various needs. While praised for its effectiveness, it is essential to note that some complications may arise with the use of Aloe vera. Therefore, it is strongly advised to seek medical supervision, especially for prolonged usage of Aloe vera products. This precaution is crucial in ensuring the maximum benefits and safety for individuals incorporating Aloe vera into their daily routines. By consulting with healthcare professionals, users can navigate any potential risks associated with the long-term use of Aloe vera and optimize their overall well-being. Embracing the benefits of Aloe vera while being mindful of potential challenges is key to harnessing its full potential. Ultimately, with proper guidance and understanding, Aloe vera can continue to be a valuable ally in promoting health and wellness across various aspects of life.

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