

## HERBAL GEL FORMULATION OF ALOE VERA: ANTIMICROBIAL AND MOISTURIZING POTENTIAL

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### ABSTRACT

The skin serves as the body's primary protective barrier, requiring adequate hydration and care to maintain its integrity. Herbal formulations provide a natural alternative to synthetic skin products, offering both therapeutic and cosmetic benefits. Among these, Aloe vera has long been recognized for its healing, soothing, antimicrobial, and moisturizing properties, making it a preferred ingredient in topical preparations. The present study focuses on the pharmaceutical assessment of an Aloe vera-based herbal gel formulated with Aloe vera gel, honey, glycerin, carbopol, coconut oil, and rose water. The developed formulation was evaluated through standard parameters to ensure safety, stability, and efficacy. Results demonstrated that Aloe vera, when combined with natural additives and polymers, enhances skin hydration, protects against microbial activity, and supports overall skin health. The findings suggest that Aloe vera herbal gel is suitable for topical administration and represents a promising approach in the growing field of herbal remedies.

**KEYWORDS:** Aloe vera; Herbal gel; Skin care; Wound healing; Antimicrobial; Moisturizing.

### 1. INTRODUCTION

Aloe vera, scientifically known as *Aloe barbadensis Miller*, is native to tropical and subtropical regions. The name "Aloe Vera" is derived from the Arabic word *Alloeh* meaning "shining bitter substance," and the Latin word *Vera* meaning "true". It is a succulent, xerophytic plant with a shrub-like appearance and pea-green leaves. These leaves are long, triangular, fleshy, and rich in sap, usually reaching up to 20 inches in length and 5 inches in width. The clear

parenchymal gel is obtained from the central part of the leaf. In some cases, aloe gel is concentrated using drying methods, while in others, it is mixed with water to prepare aloe juice products. Latex secretion occurs through pericyclic tubules beneath the yellowish-green epidermis of the leaves. This latex contains anthraquinones, which are well-known for their laxative properties. More than 90% of the 300 recognized aloe species are found in South Africa, Madagascar, and Arabia. Different species show slight variations in the concentration of active compounds. Aloe vera is among the oldest plants used for skin care and traditional medicine, with historical dating back to the first century AD. The gel is widely recognized for its soothing, healing, and protective effects on skin problems such as burns, cuts, insect bites, and inflammation. It also demonstrates anti-inflammatory, antiseptic, antibacterial, antiviral, antitumor, skin-protective, and anti-diabetic properties. By retaining moisture, stimulating cell migration, increasing collagen production, and reducing inflammation, aloe vera accelerates wound healing. Aloe vera is a common ingredient in cosmetics like moisturizers and sunscreens, as its gel helps maintain firm, hydrated, and smooth skin. It is rich in vitamins B12, A, C, E, folic acid, and several B-group vitamins, as well as 19 of the 20 essential amino acids. Because of these properties, aloe gel is often compared to vitamin A derivatives for its anti-aging effects. Fresh gel from a cut leaf can be directly applied to minor burns. The demand for aloe-based products has grown worldwide, particularly in the food and beverage industry, where aloe gel is processed into health drinks.

### 1.1. Pharmacological properties of aloe vera gel

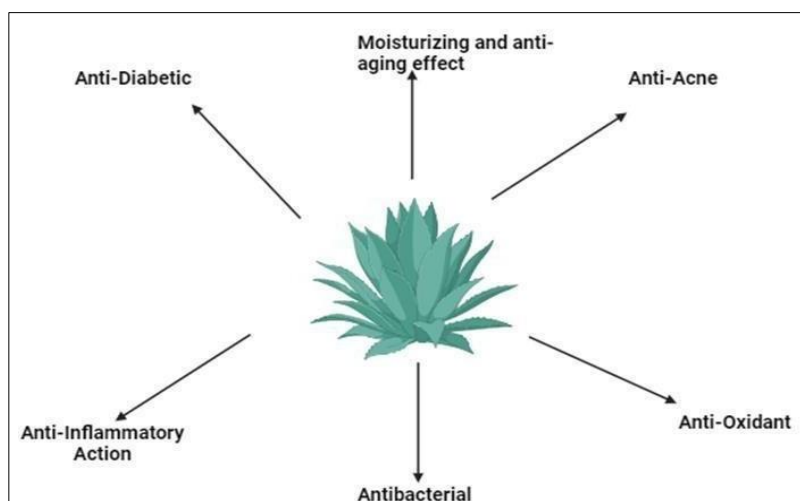


Figure 1: Pharmacological properties of Aloe-Vera.

## 2. Plant Description

Botanical Name: *Aloe barbadensis miller*

Common Names: Aloe Vera, Medicinal Aloe, True Aloe Family: Asphodelaceae



Aloe Vera is a succulent, perennial plant that thrives in tropical and subtropical regions. It grows in the form of a rosette with thick, fleshy, lance-shaped leaves.

Leaves are usually green to grey-green in color, sometimes with white spots or streaks when young. The edges of the leaves have small, soft teeth or spines.

The plant can grow up to 60–100 cm in height, depending on conditions.

Aloe Vera contains a gel-like substance inside the leaves, which is transparent, thick, and rich in bioactive compounds.

The plant produces yellow tubular flowers on tall spikes during the blooming season.

### 1. Taxonomic classification

**Table 1: Taxonomical Classification of Plants.**

<b>Kingdom</b>	Plante – plants
<b>Sub-kingdom</b>	Tracheobionta – Vascular plants
<b>Super-division</b>	Spermatophyta –Seed plants
<b>Division</b>	Magnoliophyta –Flowering plant
<b>Class</b>	Liliopsida –Monocotyledons
<b>Subclass</b>	Liliidae
<b>Order</b>	Liliales
<b>Family</b>	Aloaceae/ Liliaceae –Aloe family
<b>Genus</b>	<i>Aloe</i> Linn.

Aloe Vera, scientifically known as *Aloe barbadensis miller*, belongs to the kingdom Plantae, which includes all green, photosynthetic organisms. It is classified under the clade Tracheophytes, meaning it is a vascular plant, and further under angiosperms, indicating it is a flowering plant. Being a monocot, Aloe Vera has long, parallel-veined leaves. It falls under the order Asparagales and the family Asphodelaceae, a group that includes many succulent and medicinal plants. Within this family, it belongs to the genus Aloe, characterized by thick, fleshy leaves containing a gel-like substance, and the species barbadensis miller, which represents the true Aloe Vera widely known for its therapeutic, cosmetic, and medicinal properties.

### 3. MATERIAL AND METHODS

#### 3.1. Plant Material

This formulation was prepared using Aloe vera and honey, with Aloe vera collected from the Botanical Garden.

##### 3.1.1. Aloe-Vera

Aloe vera is widely recognized for its medicinal value, exhibiting antioxidant and antibacterial activities. It has potential benefits in reducing dental plaque, accelerating wound healing, delaying skin aging, and regulating blood glucose levels.

Benefits of Aloe-Vera

- Contains antioxidant and antibacterial properties that protect against infections.
- Supports blood sugar regulation, beneficial for people with diabetes.

- Provides deep hydration, keeping skin soft and moisturized.
- Acts as a natural conditioner, making hair smooth and shiny. -
- Helps reduce wrinkles and slow down skin aging.
- Used in cosmetics like moisturizers, sunscreens, and face masks.
- Speeds up wound healing and soothes burns, cuts, and insect bites.



**Figure 2: Aloe-Vera.**

### **3.1.2.Honey**

Honey serves as an effective preservative for Aloe vera because of its long shelf life and compatibility with diverse substances. It is predominantly composed of sugars, along with amino acids, vitamins, minerals, iron, zinc, and antioxidants. Owing to its anti-inflammatory, antioxidant, and antibacterial properties, honey offers numerous health benefits. Additionally, it helps retain moisture within the deeper layers of the skin, thereby supporting a healthy and youthful appearance.[2021]



### **Chemicals**

*Carbopol and glycerin used in this study were collected from the chemical store room2.2.1. Carbopol 940*

### **4.2.2. Glycerine**

Glycerin is effective in quickly alleviating scalp itching, while Aloe vera provides soothing relief to skin and hair damaged by sun exposure. Organic Aloe vera gradually diminishes skin spots and rashes. Additionally, Aloe vera helps retain moisture, and Glycerin enhances the radiance of both skin and hair.<sup>[23]</sup>

#### 42.3.1. Formulation and preparation of aloe vera gel

1. Fresh Aloe vera leaves were carefully harvested from the plant.
2. The leaves were thoroughly rinsed with cold water to remove any dirt or impurities.
3. The inner gel was scooped out from the leaves using a spoon or knife.
4. The extracted gel was transferred into a mortar and pestle.
5. The gel was then homogenized to achieve a smooth and uniform consistency.
6. The homogenized gel was placed in an ice cube tray and frozen.
7. Honey was added to the frozen Aloe vera gel to enhance its properties.
8. The final formulation was prepared by mixing the ingredients thoroughly.
9. Coloring agents and preservatives were incorporated into the formulation to improve its appearance and stability.



**Figure 4** Cut off the Aloe-Vera leaves



**Figure 5** Aloe-Vera Leaves



**Figure 6** Leaf under Cold water



**Figure 7** Slice off the outer layer



**Figure 8** Scooping the Gel



**Figure 9** Placing the Gel into Mortar to Homogenize it



**Figure 10** Homogenization of Gel



**Figure 11** Place the gel in Freezer



**Figure 12** Gel after Freezing



**Figure 13** Honey



**Figure 14** Mix Honey with Aloe



**Figure 15** Herbal Aloe Vera Skin Gel

#### **4.4. Evaluation of herbal aloe-vera gel**

*Evaluation research is a structured and systematic process of inquiry conducted to assess or appraise an object, program, practice, activity, or system, with the aim of generating information that supports informed decision-making.*

##### **4.4.1. Organoleptic Properties**

Visual inspection methods were employed to assess the organoleptic properties of the herbal gel, including its color, odor, texture, and physical state.

##### **4.4.2. Absorption test**

The absorption test was performed by applying the gel to the skin and massaging it until it was fully absorbed.

##### **4.4.3. Skin Irritancy test**

The irritation test was conducted by applying the formulation to the back of the hand and leaving it for 15 minutes to observe any signs of irritation, such as redness, swelling, or itching.

##### **4.4.4. Homogeneity test**

Homogeneity test was assessed by visual inspection and touch.

##### **4.4.5. pH Test**

The pH value of this purely herbal Aloe-vera Gel was determined by using digital pH meter.

##### **4.4.6. Spread-ability test**

*A 500 mg sample of gel was placed between two slides. A 200 g weight was applied on the top slide, then removed, and any excess gel was discarded. The bottom slide was secured to the apparatus, while the top slide was attached to a rigid string with a 100 g load. The time taken for the top slide to detach was recorded.*

##### **4.4.7. Smoothness**

The smoothness of the lotion formulation was evaluated by tactile examination, where the gel was rubbed between the fingers to assess its texture. Observations were made regarding whether the gel felt smooth, clumpy, homogeneous, or coarse.<sup>[25]</sup>

#### **4. Traditional uses and ethnopharmacology**

Aloe Vera (*Aloe barbadensis miller*) has been used for thousands of years in traditional medicine across various cultures due to its remarkable healing properties. Traditionally, it has been applied topically to treat burns, wounds, cuts, sunburns, and dry skin, while also being consumed as a juice or extract to aid digestion, relieve constipation, and promote liver health.

In addition, Aloe Vera has been used to reduce inflammation, joint pain, and arthritis symptoms, and to enhance hair health and scalp condition. Its ethnopharmacological significance lies in its rich content of bioactive compounds, such as anthraquinones that provide laxative effects, polysaccharides like acemannan that promote wound healing and immune modulation, enzymes that aid digestion and reduce inflammation, and vitamins, minerals, fatty acids, and amino acids that contribute to antioxidant, antimicrobial, and tissue-repairing activities. Modern studies support these traditional uses. immunomodulatory properties, which make it a valuable medicinal plant bridging traditional knowledge and contemporary herbal medicine.

## 5. RESULTS AND DISCUSSION

The Aloe vera gel formulation was prepared using various ingredients, including Aloe vera gel, glycerin, coconut oil, rose water, and honey. Aloe vera, known for its antimicrobial and hydrating properties, helps protect the skin from microbial degradation while maintaining moisture.

Glycerin contributes anti-aging benefits. The prepared herbal body lotion was evaluated for several parameters to assess its quality and performance, including physicochemical properties, pH, washability, irritancy, homogeneity, viscosity, and smoothness. The impact of the different ingredients on the formulation was also investigated.

The physicochemical evaluation revealed that the formulation had a white color, a pleasant odor, and a semi-solid consistency. Its pH was neutral, and it demonstrated good washability.

**Table 1: Result of evaluate on parameter of Herbal Aloe-Vera Skin Gel.**

S. No.	Test	Result
1	Color	Slightly yellow
2	Odor	Earthy and garlicky
3	Texture	smooth
4	State	Semi -solid
5	Absorption test	Very well Absorbed
6	Skin Irritancy test	No Irritancy effect
7	Homogeneity	Good
8	pH	6.5
9	Spread-ability Test	Smooth and light to Spread
10	Smoothness	Good

### Future Enhancement

Future enhancements of Aloe vera include the development of advanced delivery systems, such as nano-gels and liposomes, to improve skin penetration and bioavailability. Its combination with other bioactive compounds can provide synergistic therapeutic and cosmetic effects. Aloe vera-based formulations can be further optimized for stability, long shelf life, and eco-friendly applications. Additional research on chronic wound healing, anti-aging therapies, and oral care products.

## 6. CONCLUSION

The present study demonstrates that the developed herbal gel is suitable for use in warm climates. Aloe vera enhances the gel's effectiveness by maintaining skin hydration and improving its overall performance. Herbal formulations are increasingly popular worldwide, and this study highlights a successful attempt to develop a gel containing Aloe vera, honey, and turmeric powder.

Aloe vera helps in moisturizing the skin, smoothing rough areas, and aiding the healing of minor cuts and cracks. Its anti-inflammatory, anti-acne, antioxidant, anti-diabetic, and non-irritant properties allow the gel to nourish the skin and restore it to a healthy condition. Additionally, it provides soothing and moisturizing effects.

The study observed that the gel was stable at room temperature, exhibited good flow properties, and was compatible with different skin types. No irritation was detected during evaluation. Furthermore, the formulation helps protect the skin against environmental stressors while promoting nourishment. Overall, this herbal gel represents an effective, safe, and natural approach to skincare.

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