

## Formulation And Evaluation Of Herbal Gel For Wound Healing

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### Abstract:

Herbal gel intended to promote wound healing using plant-based ingredients with medicinal Qualities are the focus of this study. To create a topical gel that works, researchers have looked into The therapeutic potential of medicinal plants that have anti-inflammatory, antibacterial, and Antioxidant qualities. Antioxidants, antimicrobials, and anti-inflammatory chemicals found in Medicinal plants including garlic, aloe vera, and moringa oleifera were used to manufacture the gel. The gel composition Aloe vera gel, honey, coconut oil, garlic powder extract, and moringa seed oil Were used in its creation. The compositions’ physicochemical characteristics, including pH, Washability, viscosity, spreadibility, and skin irritation test The results suggested that the gel Formulations were homogeneous and had a nice appearance

The findings showed that the herbal gel had notable antibacterial action and good physical Properties, which made it a viable option for topical therapy. This study shows that herbal gels have The potential to be secure and efficient substitutes for artificial topical medications.

**Keywords — Aloe Vera gel , Moringa Seed Oil , Herbal gel, Herbal extract**

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### I. INTRODUCTION

Herbal medicines and plant-derived compounds have recently garnered a lot of attention because of Their numerous applications, as medicinal plants are the most plentiful source of bioactive molecules Utilized in both traditional and modern medicine.(1). Because of its natural nature, low risk of Adverse effects, and improved patient compliance, herbal products are now widely used in Pharmaceuticals and cosmetics.(2).Topical gel formulations are intended to be administered Topically or to particular mucosal locations in order to facilitate percutaneous medication penetration Or local action. In general, gels are semi-solid mixtures that have a liquid phase that has been Thickened with extra substances (3) The natural origin, reduced side effects, and growing consumer Awareness of plant-based alternatives have led to a major increase in the market for herbal cosmetics And medications worldwide. Particularly,

herbal gels provide potent skin delivery and improved Visual appeal(4). Herbal anti-inflammatory gels that are safe, non-toxic, and effective that also Improve patient compliance (5) Wound healing is a complex biological process that includes Inflammation, tissue remodeling, and proliferation. Conventional wound care techniques can call for The use of artificial medications and dressings, which can have drawbacks such antibiotic resistance And delayed healing. (6).Recent years have seen a surge in interest in herbal formulations due to Their low cost, biocompatibility, and lack of side effects. (7)

The highly prized herb Moringa oleifera Is well-known for its many pharmacological advantages, Which include wound-healing, anti-inflammatory, antibacterial, and antioxidant qualities. Ayurvedic,

Unani, and traditional medical systems all make extensive use of it.(8) Skin ailments like minor cuts, Rashes, dryness, infections, and inflammation have long been treated with moringa oil. Its Antibacterial and anti-inflammatory properties aid in wound healing and the relief of irritated Skin.(9)

The primary objective of this effort is to create a herbal wound-healing gel combining ingredients With unique medicinal benefits, such as garlic extract, honey, coconut oil, Moringa seed oil, and aloe Vera gel.

**Moringa Seed Oil: Antioxidant and Healing Properties:** Packed in phenolic chemicals, tocopherols, And oleic acid, moringa seed oil has potent anti-inflammatory, wound-healing, and antioxidant Properties. It has long been used to nourish skin and prevent infections.(10)

Since ancient times, honey has been utilized in dermatology as a moisturizing and antibacterial agent Because of its broad-spectrum antimicrobial activity, which is particularly effective against *Staphylococcus aureus*, and its inherent humectant properties, which promote tissue regeneration. (11)

**Coconut Oil: Antimicrobial and Skin Barrier Repair** This oil has antibacterial, antifungal, and Hydrating properties due to its lauric acid, capric acid, and vitamin E content. It aids in lowering Inflammation and repairing the lipid barrier of the skin.(12)

**Aloe Vera: Anti-inflammatory and Calming Properties:** Aloe vera gel is well-known for its cooling, Hydrating, and skin-soothing properties. It has vitamins, enzymes, and polysaccharides that help Repair skin and lessen redness, swelling, and irritation. (13)

**Garlic Extract: Antibacterial and Antifungal Agent:** Allicin, an ingredient in garlic (*Allium sativum*), Has potent antibacterial and antifungal qualities. It has long been used to treat wounds, acne, and Skin infections.(14)

- It may be used to treat infections.
- Cuts down on inflammation.
- Good skin absorption capacity.
- Treat sunburn and dehydration
- The cooling effect

### **Benefits:**

1)Antimicrobial Properties: Strong antibacterial, antifungal, and antiviral qualities found inHerbal extracts like garlic, neem, and honey help to prevent wound infections. For instance, aloe vera And honey keep the area moist and provide a barrier that keeps bacteria out, lowering the chance of Infection.

2) Hydration and Moisturizing Effects: Herbal gels keep wounds hydrated and prevent them from Drying out and creating thick scabs, which can delay recovery. Honey and coconut oil hydrate and Nourish the wound, creating the perfect environment for healing.

3) Cooling and Calming Effect: Aloe vera and coconut oil-based herbal gels offer a cooling effect That soothes minor cuts, burns, and wounds. The afflicted area is made more comfortable and pain-free by this calming effect

4) Versatile Applications –  
-Herbal gels can be used for various wound types, including:

### **Materials:**

#### **1).Moringa seed oil – (15)**

**Biological Name** – *Moringa oleifera* Lam

**Family** -Moringa belongs to the Moringaceae family

### **OBJECTIVE :**

- Aids in Decreased Early Aging.



Fig 1

### Moringa oil uses and benefits- (16)

1)Antioxidant: Beta-sitosterol, a phytosterol found in moringa oil, may have antioxidant andAntidiabetic effects, although further research is needed to confirm these claims

2) Anti-inflammatory When applied topically and ingested, a number of the bioactive ingredients in Moringa oil have anti-inflammatory and antioxidant properties. Moringa oil may therefore be Beneficial for acne. Among these compounds include tocopherols, catechins, quercetin, ferulic acid, And zeatin.

3) Skin cleanser and moisturizer. Moringa oil is effective topically as a moisturizer and cleanser for

### 2) Honey – (17)

**Biological Name** – Apis mellifica

**Family** – Apidae



Fig 2

### Uses and benefits – (18)

1)According to research, honey has gained popularity as a wound treatment. According to one study, Honey can help heal a variety of wounds, including burns, scrapes, and surgical wounds. Honey Contains vitamins, enzymes, and antioxidants that have antibacterial qualities.

2).Oxidative stress is lessened by honey's antioxidant qualities. An imbalance between free radicals That harm cells and your body's capacity to combat their detrimental consequences is known as Oxidativestres

### 3) Coconut oil – (19)

**Biological Name** – Cocos nucifera (L.)

**Family** – Arecaceae



Fig 3

### Uses and benefits – (20)

1)Coconut oil promotes the healing of minor burns, abrasions, and wounds. The lesion will be Shielded from infections and promote tissue repair because a thin layer of protective tissue will grow Over the wound.

2). Coconut oil relieves irritated skin due to its anti-inflammatory qualities. Lauric acid, an Ingredient in this multipurpose oil, helps reduce skin irritation, redness, swelling, and itching caused By conditions like psoriasis or eczema.

3). A natural humectant that aids in retaining skin moisture is coconut oil. The most well-known Aspects of this miracle oil are its ability to nourish the skin because of its high fat content, especially Medium-chain fatty acids, and vitamin E content,

which helps the skin retain moisture and create a Protective barrier

4) Enhances Skin Elasticity and Reduces Wrinkles: Because of its antioxidant-rich profile and Capacity to keep skin hydrated, regular usage of coconut oil improves skin firmness and smoothness.

#### 4) Aloe vera gel – (21)

**Biological Name** – Aloe Barbadensis Miller  
**Family**–Asphodelaceae(Liliaceae)



Fig 4

#### Use and Benefits- (22)

- 1) You can use aloe vera gel to minor burns up to three times every day. Additionally, gauze May be required to protect the area.
- 2) Due to its easy absorption, aloe vera gel is ideal for oily skin. However, dry skin can also be Treated with it. Consider using aloe instead of your typical moisturizer to help seal moisture Into your skin after taking a shower.
- 3) If you're used to using Neosporin for minor cuts, try aloe vera instead. Its molecular Composition encourages collagen and suppresses microbes, accelerating
- 4) Skin Regeneration and Wound Healing: Aloe vera promotes angiogenesis, collagen Synthesis, and fibroblast activity, which speeds up skin regeneration and wound closure.

#### 5) Garlic powder –(23)

**BiologicalName**–AlliumsativumL



Fig 5

#### Use and Benefit –

- 1) Allicin, a sulfur molecule found in garlic powder, has potent antibacterial and antimicrobial Properties against bacteria such as Salmonella, E. Coli, and Staphylococcus aureus.(24)
- 2) Antifungal Properties: Because garlic powder may break down fungal cell membranes, it Works well against a variety of fungal types, including Candida albicans. (25)
- 3) Anti-inflammatory Effects: Garlic helps relieve joint pain and skin irritation because it Contains diallyl sulfides, which suppress inflammatory enzymes like COX-2. (26)
- 4) Wound Healing and Skin Infections: When used topically, garlic powder's antibacterial and Antioxidant qualities can aid in wound healing and guard against infection (27)
- 5) Antioxidant Activity: Packed with organosulfur compounds, garlic powder helps shield the Skin from oxidative stress and early aging by scavenging free radicals.(28)

#### Methodology : (29)

Garlic powder extraction involves adding 500 millilitres of alcohol as a solvent to 30 grams of garlic Powder in a Soxhlet device and letting it stand for 4 hours. After six hours, filter and collect the



5ml of extract was taken in a test tube and 2ml of chloroform was added to it Followed by The Addition of 3ml of conc. Sulphuric acid. Appearance of yellow Colour

#### Evaluation parameters:(31)

##### 1) PH determination:

The pH paper was submerged in the formulation to determine the pH of the gel.

##### 2)Washability test:

To ascertain the washability test, a little amount of the generated formulation was applied to the Skin, followed by a water rinse. After applying a little amount of the produced formulations (gels) to The skin, warm water was used to cleanse it.

##### 3)Spreadability:

Two sets of glass slides of the same size were collected. There is the herbal gel formulation on One of the slides. After the other slide was placed on top of the gel, the gel was sandwiched between The two slides at a location that was 4.5 cm apart along the slides. The top slides were coated with a Thin layer of 100 grams of gel that had been uniformly squeezed between the two slides.

##### 4)Skin irritation test:

This test involves applying a chemical topically for 42 minutes using the skin ethic model the human Epidermis. To determine whether there was any irritation or whether the wound was itchy or red, the Gel was produced, applied, and left there for forty-two minutes.

##### 5) Organoleptic characteristic:

Most gels have a viscous viscosity and are homogenous, transparent, fluid, elastic, and flexible. As A viewing form, the organoleptic characteristics and the type of gel observed in vitro were noted.

#### Result:

The creation and assessment of the herbal gel were made possible by carefully examining each Measurement needed for the gel. The herbal gel is the most effective gel and is achieving excellent Wound healing results when all assessment

#### Preparation method –

- 1)Combine coconut oil and moringa seed oil in a water bath.
- 2) Include honey and garlic extract in the oil mixture.
- 3) Between 25°C and 30°C, at room temperature.Mix the aloe vera gel into this mixture until it's Uniformly smooth
- 4) Stir continuously for ten to fifteen minutes

#### Formulation Table 1

Herbal ingredients	Quantity
Garlic extract	5 ml
MoringaSeedOil	3ml
Honey	4 ml
Aloe Vera gel	10 ml
Coconut oil	2ml

#### Phytochemical Analysis: 30)

##### 1) Test for Glycosides –

Add NaOH to the extract. A yellow color indicates the presence of glycosides

##### 2) Test for Tannins –

1ml of the extract was added with 5ml of Distilled water and kept for boiling in hot Water Bath. After boiling sample was Cooled down and to this 0.1% ferric Chloride solution was Added. Appearance Of greenish colour Confirms the presence of tannins

##### 3) Test for Flavonoids –

Add a few drops of NaOH to the extract. A yellow color apperance

##### 4) Test for Terpenoids –

parameters are taken into account. Each evaluation Demonstrates the good quality of the herbal gel formulation. Additionally, more research improves The formulation of future gels.

**Table no .2: Phytochemical Analysis**

Test	Observation	Result
Test for Glycosides	Yellow colour	Glycosides present
Test for Tannis	Greenish colour	Tannis present
Test for Terpenoid	Yellow colour	Terpenoid present
Test for Flavonoid	Yellow colour	Flavonoid present

**Evaluation Parameters**

1) PH determination –

The pH of the formulated herbal gel was measured and found to be 7.0, indicating a neutral pH. This value falls within the acceptable range for topical applications, ensuring skin compatibility

2) Washability test –

The washability test was conducted by applying the herbal gel to the skin and rinsing it with water. The gel was observed to be easily washable, leaving no visible residue. This indicates good Washability, which enhances user compliance and ease of application.

3) Spreadability test –

Spreadability test for a herbal gel formulation, which evaluates how well the gel spreads under a Standardized force. Based on your description, the spreadability can be calculated using the Following formula:

$$S = M \times L \div T$$

Where:

= Spreadability (g·cm/s)

= Weight applied (100 g)

= Distance between the slides (4.5 cm)

= Time taken for the upper slide to move (60 sec)

With a length of 4.5 cm and a time of 60 seconds, the spreadability of the herbal gel formulation is 7.5 g·cm/s.



Fig 7

4)Skin irritation test –

The herbal gel did not cause any visible signs of irritation, redness, or swelling, confirming its Suitability for topical application

5)Organoleptic Characteristics

Colour	Light green colour
Odour	Garlic like smell
Texture	Smooth

Table no 3

**Conclusions** :The formulated herbal gel incorporating Moringa Seed Oil, honey, coconut oil, aloe vera gel, and Garlic extract demonstrated promising wound healing properties. Each ingredient contributed Synergistically due to their well-documented antimicrobial, anti-inflammatory, antioxidant, and Moisturizing effects. The final gel formulation exhibited desirable physicochemical characteristics Including good spreadability, stability, and a soothing effect upon application. Evaluation studies Revealed significant improvement in wound contraction and healing time, suggesting the potential of This herbal formulation as an effective and natural alternative to synthetic wound healing agents. Further in vivo and clinical

studies are recommended to confirm its efficacy and safety for Commercial use.

Each ingredient contributed to the wound-healing potential of the gel:

- 1) Moringa seed oil promoted tissue regeneration via having antibacterial, anti-inflammatory, And antioxidant qualities.
- 2) Aloe vera gel accelerated wound healing by improving epithelialization, moisturizing, and Having calming effects.
- 3) Garlic extract helped prevent infections by demonstrating potent antibacterial and anti-inflammatory properties.
- 4) Honey promoted a quicker recovery by acting as a natural humectant, antibacterial, and Wound-healing agent.
- 5) Coconut oil kept skin hydrated by providing antibacterial protection and moisturizing Properties.

The presence of tannins was verified by the tannins test, which may have astringent and Antibacterial properties that promote wound Good removal qualities were shown in the washability Test, guaranteeing user ease.

Overall, the formulated herbal gel represents a promising natural wound-healing agent with Antimicrobial, anti-inflammatory, and regenerative properties. Further in vivo studies and clinical Trials are recommended to validate its efficacy and potential for commercial application.

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