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Formulation and Evaluation of Herbal Wound Healing Cream

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Abstract: *Wound healing is a dynamic and multifaceted biological process involving a sequence of overlapping stages: hemostasis, inflammation, proliferation, and remodeling. Effective wound care aims not only to prevent infection but also to accelerate tissue regeneration and minimize scarring. In recent years, there has been a surge in interest toward herbal-based therapies, driven by the limitations of synthetic drugs, including side effects, antimicrobial resistance, and cost. Herbal wound healing creams, formulated using extracts from medicinal plants, have demonstrated significant therapeutic potential due to the presence of diverse bioactive constituents such as flavonoids, phenolic acids, alkaloids, terpenoids, and tannins. These phytochemicals exert a range of beneficial effects including anti-inflammatory, antioxidant, antimicrobial, analgesic, and angiogenic activities, which collectively promote wound contraction, collagen synthesis, epithelialization, and tissue remodeling. Numerous plant species, such as Aloe vera, Calendula officinalis, Curcuma longa, and Azadirachta indica, have been extensively studied for their wound healing properties and are commonly incorporated into topical formulations*

Keywords: Curcumin, Lavender Oil, Aloe vera, Anti-inflammatory, Anti Oxidant

I. INTRODUCTION

1.1 Wound : A wound is an injury that results in a break or disruption of the skin and, in some cases, the underlying tissues. It can be caused by physical, chemical, thermal, or microbial factors. Wounds are typically classified into acute and chronic types. Acute wounds, such as cuts, burns, or surgical incisions, usually heal in a predictable and timely manner, while chronic wounds, such as diabetic ulcers or pressure sores, take longer to heal due to complications like infection or poor blood supply. The wound healing process occurs in four main stages: hemostasis, inflammation, proliferation, and remodeling. Each stage plays a crucial role in restoring the integrity of the skin. Several factors, including age, nutrition, underlying diseases, and infections, can influence the healing process. Proper wound care is essential to prevent complications and support effective healing.

1.2 Anatomy And Physiology Of Skin : The skin is a complex organ composed of three main layers: the epidermis, dermis, and hypodermis (subcutaneous tissue). Each layer plays a vital role in protecting the body and in the wound healing process. The epidermis, the outermost layer, provides a physical barrier and is primarily involved in re-epithelialization during healing. The dermis contains blood vessels, nerve endings, fibroblasts, and collagen fibers, all of which are essential for the inflammatory response, formation of granulation tissue, and collagen synthesis during the proliferative and remodeling phases. The hypodermis, composed mainly of fat and connective tissue, offers cushioning and supports blood flow to the upper layers, aiding in tissue repair. During wound healing, the skin undergoes four stages: hemostasis (clot formation), inflammation (immune response), proliferation (tissue regeneration), and remodeling (tissue strengthening). The physiological functions of skin—such as temperature regulation, immune defense, and cellular turnover—are closely integrated with these healing phases, ensuring timely restoration of the skin's barrier function and structural integrity.

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II. MATERIALS AND EQUIPMENTS

2.1 Materials

Aloevera :

Synonyms: Aloe barbadensis, Ghritkumari, Barbados Aloe.
Biological Source: Gel from the leaves of Aloe barbadensis Miller.
Family: Asphodelaceae (formerly Liliaceae)
Chemical Constituents: Acemannan, aloin, emodin, vitamins (A, C, E, B12), minerals, enzymes, amino acids.
Uses: Wound healing, skin care, anti-inflammatory, antimicrobial, laxative (latex), digestive aid.

(Fig 1 : Aloe Vera)

Calendula Officinalis:

Synonyms: Pot Marigold, Garden Marigold.
Biological Source: Dried florets of Calendula officinalis.
Family: Asteraceae (Compositae)
Chemical Constituents: Flavonoids, triterpenoids, carotenoids, saponins, essential oils, phenolic acids.
Uses: Wound healing, anti-inflammatory, antiseptic, skin soothing, used in creams and ointments for cuts, burns, and rashes.

(Fig 2 : Calendula Officinalis)

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Curcuma Lunga :
Synonyms: Turmeric, Haldi.
Biological Source: Dried rhizomes of Curcuma longa.
Family: Zingiberaceae.
Chemical Constituents: Curcumin, demethoxycurcumin, bisdemethoxycurcumin, essential oils (turmerone, zingiberene), polysaccharides.
Uses: Wound healing, anti-inflammatory, antioxidant, antimicrobial, used in skin care, traditional medicine, and as a coloring and flavoring agent.

(Fig 3 : Curcuma Longa)

Azadirachta Indica :
Synonyms: Neem.
Biological Source: Leaves, bark, seeds of Azadirachta indica.
Family: Meliaceae.
Chemical Constituents: Azadirachtin, nimbin, quercetin, salannin.
Uses: Antibacterial, antifungal, antimalarial, skin diseases, dental care, insect repellent.

(Fig 4 : Azadirachta Indica)

Lavender Oil :
Synonyms: Lavandula oil, Lavender oil.
Biological Source: Lavandula angustifolia (flowers)

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Family: Lamiaceae.
Chemical Constituents: Linalool, linalyl acetate, cineole, camphor.
Uses: Antiseptic, anti-inflammatory, stress relief, wound healing, aromatherapy.

(Fig 5 : Lavender Oil)

2.2 Equipments And Uses :

Table 1 : Equipments

Sr.No	Equipments	Uses
1	Beaker	For measuring and mixing ingredients
2	Water- Bath	To gently heat and melt beeswax and oils
3	Stirring Rod	For manual mixing
4	Homogenizer	To blend the cream to a uniform consistency
5	Thermometer	To monitor temperature during heating and cooling
6	Weighing Balance	For accurate measurement of ingredients
7	Spatula	For transferring semi-solid cream
8	Sterilized Container	For storing the finished cream
9	Measuring Cylinders	For measuring essential oils and liquids
10	Glove And Mask	For maintaining hygiene during preparation

INGREDIENTS :

Table 2 : Ingredients

Sr.No	Ingredients	Quantity (100gm)
1	Aloe vera Gel	30 gm

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2	Turmeric Extract	5 gm
3	Neem Extract	5gm
4	Calendula Extract	5 gm
5	Bees Wax	10 gm
6	Lavender Oil	As Required

USES OF THE INGREDIENTS :

Table 3 : Uses Of Ingredients

Sr. No	Ingredients	Uses
1	Aloe vera Gel	Soothes skin, promotes wound healing, moisturizes.
2	Turmeric Extract	Anti-inflammatory, antiseptic, promotes skin repair.
3	Neem Extract	Antibacterial, antifungal, treats infections.
4	Calendula Extract	Anti-inflammatory, speeds up healing, reduces skin irritation.
5	Lavender Oil	Antiseptic, calming, promotes tissue regeneration.
6	Bees Wax	Cream base, provides texture, forms protective barrier.
7	Preservative	Extends shelf life and prevents microbial growth.

FORMULATION OF CREAM :

1. Preparation of Water Bath:

Set up a water bath to gently heat ingredients without direct flame.

2. Melting the Base:

In a beaker, add beeswax and coconut oil. Place it in the water bath and heat until completely melted (around 70–75°C).

3. Cooling Phase:

Remove from heat and allow it to cool to around 40–45°C.

4. Adding Herbal Extracts:

Slowly add Aloe vera gel, Turmeric extract, Neem extract, and Calendula extract. Stir continuously to ensure uniform mixing.

5. Incorporating Essential Oils:

Add Lavender essential oil and Vitamin E oil (if using).Add preservative if desired, according to recommended concentration.

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6. Blending:
Use a homogenizer or hand blender to mix until a smooth, creamy consistency is achieved.

7. Packaging:
Pour the cream into sterilized containers while still warm.Allow to cool completely at room temperature.

III. EVALUATION TEST

1. Physical Appearance
Test: Visual inspection
Purpose: Check for color, consistency, and homogeneity
Expected: Smooth, uniform cream with no phase separation

2. pH Determination
Test: Using a pH meter or pH paper (1% cream in distilled water)
Purpose: Ensure skin compatibility
Expected Range: 5.5–7.0

3. Spreadability Test
Test: Measure the diameter of cream spread between glass slides under specific weight
Purpose: Assess ease of application
Expected: Good spreadability without being too runny or stiff

4. Viscosity
Test: Using a viscometer
Purpose: Determine the cream's thickness
Expected: Moderate viscosity, suitable for topical use

5. Extrudability
Test: Measure the amount of cream extruded from a tube under pressure
Purpose: Assess user-friendliness
Expected: Easily extrudable without excessive pressure

6. Skin Irritation Test (Patch Test)
Test: Apply small amount to skin (e.g., forearm)
Purpose: Check for redness, itching, or allergic reaction
Expected: No irritation

7. Microbial Load Test
Test: Standard plate count
Purpose: Ensure microbial safety of the cream
Expected: Within acceptable limits (or absent with preservative)

8. Stability Test
Test: Store at different temperatures (e.g., room temp, 4°C, 40°C) over weeks
Purpose: Check for phase separation, color change, or pH change
Expected: Stable appearance and pH over time

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STORAGE CONDITION :

Temperature: Store at cool room temperature (15°C–25°C)
Humidity: Keep in a dry place, away from moisture.
Light: Store in dark or amber-colored containers to protect from light degradation (especially essential oils)
Air Exposure: Keep containers tightly closed to avoid oxidation and contamination.
Refrigeration (optional): Can be stored in a refrigerator to extend shelf life, especially if no preservative is used.

IV. RESULT

The formulated herbal wound healing cream containing Lavender oil, Aloe vera, Turmeric (Curcuma longa), Neem (Azadirachta indica), and Calendula (Calendula officinalis) was evaluated for its physical and therapeutic properties. The cream exhibited a smooth, homogeneous texture with a pleasant aroma and light yellow color. The pH of the formulation was found to be 6.0 ± 0.2, which is within the acceptable range for topical preparations and safe for skin application. The spreadability was good, indicating ease of application without being too greasy or runny. Viscosity measurements confirmed a stable semi-solid consistency suitable for external use. Extrudability tests showed that the cream could be easily dispensed from a tube with minimal pressure. No signs of skin irritation, such as redness or itching, were observed during patch testing on human volunteers, suggesting excellent dermatological compatibility. Stability studies conducted over 30 days at various temperatures showed no signs of phase separation, pH change, or degradation in physical appearance. Preliminary observations on minor wounds and abrasions revealed that the cream promoted faster healing within 4–5 days, with noticeable reduction in inflammation and improved skin regeneration. These results suggest that the combination of herbal ingredients in the cream exerts a synergistic wound healing effect.

V. CONCLUSION

The present study successfully formulated and evaluated a herbal wound healing cream incorporating Lavender oil, Aloe vera, Turmeric, Neem, and Calendula extracts. The cream demonstrated desirable physical properties, including appropriate pH, consistency, spreadability, and stability, making it suitable for topical application. Safety evaluation showed no signs of skin irritation, indicating its compatibility with human skin. Preliminary observations suggested enhanced wound healing activity, likely due to the combined antimicrobial, anti-inflammatory, and regenerative properties of the natural ingredients. Overall, the formulation holds promise as an effective and safe herbal alternative for managing minor wounds and skin injuries. Further clinical studies can be conducted to support its therapeutic potential and commercial viability.

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