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Preparations and evaluation of herbal wound healing cream

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Abstract:

Wound injuries present a substantial healthcare challenge, particularly in resource-limited settings, where access to advanced treatment options is limited. Herbal medicine presents a promising alternative due to its cost-effectiveness, safety, and ability to address multiple health concerns simultaneously. The objective of this study is to assess the healing capabilities of four commonly used herbal ingredients: Aloevera, centella asiatica and lawsonia inermis. These plant-derived extracts demonstrate a wide array of biological activities, such as anti-inflammatory, antiseptic, and wound-healing properties. When used together in creams, these herbal ingredients work together to help wounds heal faster, increase collagen production, and speed up the process of new skin growth. A significant characteristic identified in these formulations is the stimulation of angiogenesis, which is crucial for ensuring adequate oxygenation and nutrient delivery to the affected tissues, particularly in severe wounds. After conducting a thorough analysis of both experimental and clinical research, it was concluded that creams containing these extracts have a positive impact on outcomes by influencing cellular responses, promoting tissue remodeling, and reducing scarring. Due to their efficiency, availability, and safety, these natural remedies offer a practical and long-lasting alternative to traditional wound treatments. Additional research into the combined effects of these herbs could potentially lead to the creation of more efficient and cost-effective wound care treatments.

Key words: skin , wound injury, Aloevera , gout kola, henna, , wound healing.

Introduction

Wound injuries can happen as a result of different causes, including exposure to heat, electricity, radiation, or chemicals like acids.[1'2] They can cause harm to cells and tissues, leading to damage, which may occur due to inflammation, exposure to harmful substances, or infections caused by microorganisms.[3'4] Wounds are categorized based on the depth and severity of their damage. A first-degree wound impacts the outermost layer of the skin, resulting in discomfort and a reddened appearance. A second-degree wound goes deeper into the skin, resulting in intense pain and necessitating medical attention. Third-degree wounds penetrate the dermis, increasing the risk of infections and requiring surgical intervention. Fourth-degree wounds extend beyond the skin, causing harm to tissues, muscles, and bones, leading to the loss of affected areas. [5'6]

The process of healing a wound involves two distinct phases: the proliferative phase and the remodelling phase. The proliferative phase concentrates on wound healing and blood vessel formation, facilitated by keratinocytes and fibroblasts. The remodelling phase guarantees wound healing and scar formation, incorporating collagen fibres, elastin proteins, and fibroblasts or my fibroblasts.[7'8]

Herbal creams offer a natural, gentle approach to wound healing, incorporating plant-based ingredients known for their regenerative and soothing properties. Aloe Vera, henna (*Lawsonia inermis*), and gotu kola (*Centella asiatica*) are widely recognized for their beneficial effects on skin health and wound healing. Aloe Vera is rich in polysaccharides, magnesium lactate, and C-glucose hormone, which support wound recovery by promoting hydration, reducing inflammation, and protecting against bacterial infections.[9] Henna contains lawsone, tannins, and flavonoids, providing antimicrobial properties, a cooling effect on the skin, and aiding in tissue repair while reducing swelling.[10] Gotu kola, packed with triterpenoids, asiaticoside, and madecassoside, enhances collagen production, boosts skin elasticity, accelerates wound healing, and minimizes scarring while also offering antioxidant and anti-inflammatory benefits.[11] These herbal components, combined with essential oils and bioactive compounds, work synergistically to promote healing, reduce inflammation, and minimize scarring without the adverse effects associated with synthetic formulations. Collectively, these natural ingredients contribute to skin regeneration, protection, and overall healing, making them valuable in medicinal and cosmetic applications.

Fig.1 Aloe vera

Fig.2 Henna

Fig.3 Gotu kola

Herbal-based wound care formulations are emerging as effective alternatives for wound treatment and scar management. Conventional wound dressings often contain antimicrobial agents that may have cytotoxic effects, potentially delaying the healing process when used over extended periods. Additionally, some commercial dressings lose their moisturizing properties, causing them to adhere to the wound and damage newly regenerated tissue.[12,13,14]

Materials And Method

- **Extraction of plant drugs**

All the plant leaves were collected from local farm, dried and create the fine powder . the powdered plant drug extracted by soxhlet apparatus and extract with methanol as a solvent . the solvent was removed and concentrated extract of each plant was found. [15]

- **Formulation of herbal cream**

To prepare the herbal cream, the oil phase ingredients were melted in a beaker using a water bath while maintaining constant stirring . Meanwhile, the aqueous phase components were blended and warmed to match the oil phase temperature (around 70°C). Preservatives such as methyl paraben and propyl paraben were incorporated into the aqueous phase and heated to ensure proper dissolution. Once both phases reached the desired temperature, the oil phase was gradually added to the aqueous phase while continuously stirring to achieve a stable emulsion. The plant extracts were then carefully mixed into the prepared cream base with uniform stirring using a mechanical stirrer. To finalize the formulation, water was added and blended to achieve the desired consistency. The finished herbal cream was then stored in a suitable container for future use. [15]

Table 1 : Composition of herbal cream

Ingredients	**F1**	**F2**	**F3**
Bees wax	3 gm	4 gm	3.5 gm
Liquid paraffin	10 ml	15 ml	13 ml
Methylparabin	0.02 gm	0.04 gm	0.03 gm
borax	0.2 gm	0.4 gm	0.3 gm
Rose oil	Q.s	Q.s	Q.s
water	Q.s	Q.s	Q.s
aloe vera	1 ml	1.5 ml	2 ml
centella asiatica	2 ml	1 ml	1.5 ml
lawsonia inermis	1.5 ml	2 ml	1 ml

Evaluation of herbal cream

The formulated herbal cream was evaluated by its organoleptic and physic-chemical properties

- **Organoleptic properties**
- **Appearance**

The visual characteristics of the cream were evaluated based on its colour, pearlescence, and texture, and then categorized accordingly.

- **Colour and odour**

The appearance of the cream was studied by its colour ,pearl scence and roughness and graded.

- **Physic-chemical properties**
- **pH**

The pH meter was first calibrated with standard buffer solutions. Approximately 0.5 g of the cream was accurately weighed, dispersed in 50.0 mL of distilled water, and its pH was then determined.[16]

- **homogeneity**

Homogeneity of the formulations was evaluated through visual inspection and tactile assessment.[17]

- **Greasiness**

The cream was applied as a thin layer on the skin surface and examined for the presence of any oily or greasy residue.[18]

- **Viscosity**

The viscosity of the formulations was measured using a rotational viscometer (Brookfield DVII, Germany) equipped with a TA spindle at 25 ± 1°C. Measurements were performed in triplicate at 100 rpm, and the results were expressed in centipoise (cP).[19]

- **Irritancy**

An area of 1 cm² was marked on the dorsal surface of the left hand. The cream was applied to this designated region, and the time of application was recorded. Observations for any signs of irritancy, erythema, or edema were made at regular intervals for up to 24 hours and documented accordingly.[19]

- **Phase separation**

The formulated cream was stored in a sealed container at a temperature range of 25–100 °C, protected from light. Phase separation was monitored over a period of 30 days, with observations recorded every 24 hours to detect any changes.[19]

- **Spreadability**

Spreadability was determined by measuring the time (in seconds) required for two glass slides to separate under a specific load, with the cream placed between them. A shorter time indicates better Spreadability. Two glass slides of standard dimensions were used for the test. A measured amount of cream was placed on one slide, and another slide was positioned over it to form a sandwich-like structure. A fixed weight was then placed on the upper slide to ensure even spreading of the cream into a thin layer. After a short duration, the weight was removed, and any excess cream was gently scraped off the edges. The upper slide was then allowed to move freely under the influence of a tied standard weight. The time it took for the upper slide to slip off was recorded.[20]

Spreadability was calculated using the formula:

Spreadability (S) = (m × l) / t

Where,

m = weight attached to the upper slide (30 g)

l = length of the glass slide (5 cm)

t = time in seconds for the upper slide to move

- **Wash ability**

A small quantity of the cream was applied to the hand and subsequently rinsed off with tap water.[20]

- **Anti-bacterial activity**

The antibacterial efficacy of the formulated substance was assessed employing the cup plate diffusion technique. Initially, 100 mL of nutrient agar medium was prepared and sterilized by autoclaving at 121°C for 15 minutes. Under aseptic conditions, the medium was inoculated with a standardized microbial suspension. Subsequently, 20 mL of the inoculated agar was poured into each sterile Petri dish and allowed to solidify. Once the agar solidified, wells were aseptically created in the centre of each plate using a sterile cork borer. These wells were then filled with the test formulation. The plates were incubated at 37°C for 24 hours to facilitate diffusion. Post-incubation, the zones of inhibition surrounding each well were measured and compared to control plates to evaluate the antibacterial activity.[21]

Result And Discussion

The evaluation result of all the 3 formulations are given below.

- **Appearance**

When the formulations kept for long time , it found that no change in colour , odour and texture of cream.

- **Colour and odour**

The colour of the cream is found to be light green to greenish brown , resulting from the natural pigment present in herbal drug and the odour of cream is characteristic of rose.

- **pH**

The pH of the cream was measured to be between 6 and 7, which is considered optimal for the skin. All the formulations exhibited pH values close to the ideal range required for skin compatibility.

- **Homogeneity**

The cream was observed to be uniform, with no evidence of any heterogeneity.

- **Greasiness**

The cream was applied to the skin as a thin layer and assessed for any oily or greasy appearance. Based on the observations, it was concluded that all three formulations were non-greasy.

- **Viscosity**

Viscosity measurements were performed using a Brookfield Viscometer (DV II+ Pro model) with spindle number S-64, set at 20 rpm and maintained at 25°C. The measurements were taken in triplicate, and the average of the three readings was recorded. The viscosity values ranged from 2156 to 3156.

- **Irritancy**

During the irritancy testing, the formulations were applied to the skin and monitored for any adverse reactions. No signs of redness, swelling (edema), inflammation, or irritation were observed, indicating that the formulations were well-tolerated and did not cause any skin sensitivity or discomfort.

- **Wash ability**

The wash ability test was performed by applying a small amount of the cream onto the surface of the hand. After allowing the cream to remain for a short period, the hand was rinsed with tap water. The ease with which the cream was removed was observed. All three formulations were found to be easily washable, with no residue left on the skin after rinsing, indicating good water solubility and ease of removal.

- **Phase separation**

The prepared cream was stored in a sealed container at a temperature range of 25-100°C, shielded from direct light. The cream was then monitored for phase separation over a period of 24 hours, and the observations were continued for up to 30 days. Throughout this period, no signs of phase separation were detected in any of the three formulations, indicating stability in the cream's consistency.

- **Spreadability**

The Spreadability of the three formulations (F1, F2, and F3) was assessed using a slide test. In this test, the time required for the two slides to separate after the cream was applied was measured. According to the evaluation criteria, a shorter separation time indicates better spreadability. Based on this, formulation F2 exhibited superior spreadability, as it showed the quickest slide separation compared to F1 and F3.

Table 2 : Evaluation of herbal cream

	Colour	pH	Viscosity	Homogeneity	Greasiness	Irritancy
F 1	light green	6.7	2146	***	Non-greasiness	Non-irritant
F 2	light green	7.1	2560	***	Non-greasiness	Non-irritant
F 3	light green	6.9	3256	***	Non-greasiness	Non-irritant

- **Anti-bacterial activity**

The antibacterial efficacy of the cream was assessed using the agar well diffusion method. The microbial strains tested included *Staphylococcus aureus* and *Escherichia coli*. After the plates were incubated for 24 hours at 37°C, the zones of inhibition were measured to evaluate the extent of antimicrobial activity. The formulation produced distinct and clear inhibition zones, suggesting significant antibacterial action. The observed zone diameters were 21 mm against *S. aureus* and 25 mm against *E. coli*, indicating that the formulation exhibited broad-spectrum antibacterial properties.

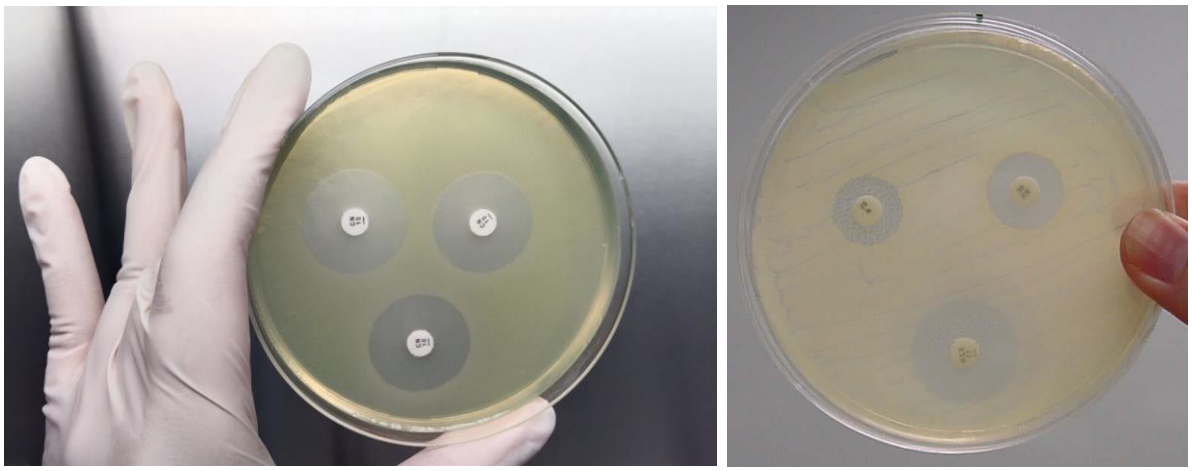

Fig.4 zone of inhibition

Conclusion

The formulated herbal cream exhibited remarkable characteristics with significant nutritional benefits, all while keeping the use of chemicals to a minimum, making it both a safe and effective option for addressing various skin issues. The inclusion of natural, easily accessible ingredients such as Aloe vera gel, Henna, and Gotu kola enhanced the cream's versatility, providing antimicrobial, anti-inflammatory, and skin-soothing properties. The preparation process was simple and cost-efficient, which further contributed to the cream's accessibility and affordability. Stability studies demonstrated that all three formulations (F1, F2, and F3) maintained their stability under normal room temperature conditions, ensuring their safety and continued effectiveness for topical application. In conclusion, this herbal cream represents a promising, natural alternative to synthetic skincare products, offering both protective and therapeutic benefits for healthy skin.

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