

**FORMULATION AND EVALUATION OF POLY HERBAL WOUND HEALING
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ABSTRACT

Healing wounds is a complex process that involves the repair and regeneration of tissues. Herbal medicines^[3,4] have a long history of being used to treat wounds because of their antimicrobial, anti-inflammatory, and antioxidant properties. In this study, our focus was on creating and testing a polyherbal ointment for wound healing.^[1,2] The ointment contains extracts from Tridax procumbens,^[7,13] Lantana camara Linn., Aloe vera,^[9,18] and Neem,^[4,9,16] all well-known for their therapeutic benefits in wound healing.^[1,2] We formulated the ointment by blending these plant extracts with petroleum jelly, stearic acid, glycerin, triethanolamine, and purified water. The evaluation of the ointment included assessments of its physical appearance, pH, spreadability,^[20,26] consistency, antimicrobial activity, and more. The results showed that the ointment had favorable physical properties, appropriate pH, good spreadability, and did not cause skin irritation. Additionally, the herbal ingredients demonstrated effective antimicrobial activity^[13,28] against microorganisms that contribute to wound formation. This study suggests that the polyherbal ointment could be a safe and effective topical treatment for promoting wound healing.^[1,2]

KEYWORDS: polyherbal Ointments, Wound Healing, Tridax Procumbens, Lantana Camara Linn, Aloe Vera, Neem, Antimicrobial Activity.**INTRODUCTION**

Wound healing^[1,2] is a natural biological process that helps restore damaged tissue. It involves a series of complex events, including inflammation, tissue formation, and tissue remodeling. While synthetic drugs are commonly used for wound treatment, they can have side effects and lead to resistance. Herbal medicines^[3,4] have become popular due to their safety, effectiveness, and minimal side effects. Plants contain bioactive compounds like flavonoids, alkaloids, tannins, and glycosides that aid in accelerating wound healing.^[1,2] Herbal ointments made from medicinal plants have long been used to treat wounds, burns, and skin infections. Polyherbal formulations^[8,14,27], combining the healing effects of multiple herbs, offer enhanced healing properties. In this study, a polyherbal wound healing^[1,2] ointment was created using Tridax procumbens, Lantana camara^[7,13], Aloe vera^[9,18], and Neem, known for their wound healing^[1,2] and antimicrobial properties.

Wound

A wound occurs when living tissue is injured by physical, chemical, or biological factors, disrupting the normal structure and function of the skin or underlying tissues. Wounds can be caused by accidents, surgery, burns, infections, or trauma. The body naturally heals wounds by repairing damaged tissue to restore normal function.

Types of Wounds

Wounds vary in type based on their nature and how they are caused.

1. Open Wounds

These wounds expose underlying tissues due to damage to the skin surface. Examples include.

- Abrasion
- Laceration
- Incision
- Puncture wound

2. Closed Wounds

These wounds occur without breaking the skin surface. Examples include.

- Contusion
- Hematoma

3. Acute Wounds

Acute wounds heal quickly through the standard healing process.

4. Chronic Wounds

Chronic wounds take longer to heal due to infection or underlying medical conditions.

The Natural Progression of Wound Healing.^[1,2]

When a wound occurs, the body undergoes a series of stages to heal itself effectively.

Phases of wound

1. Hemostasis Phase

Initially, blood clotting kicks in to stop the bleeding.

2. Inflammatory Phase

White blood cells work to clear out bacteria and damaged tissue, reducing the risk of infection.

3. Proliferative Phase

During this stage, new tissue and blood vessels develop, and collagen is generated to support the healing process.

4. Remodeling Phase

Finally, the newly formed tissue strengthens, and the wound gradually closes up.

Factors Influencing Wound Healing^[1,2]

Several factors can impact how quickly and efficiently a wound heals, including.

Local Factors

- Presence of infection
- Oxygen levels
- Blood circulation
- Moisture levels
- Foreign particles in the wound

Systemic Factors

- Age
- Nutrition
- Diabetes
- Immune system health
- Medication use

Unlock the Benefits of Herbal Wound Healing^[1,2] Cream.

Herbal remedies offer numerous advantages for promoting wound healing,^[1,2] such as.

- Accelerating the healing process
- Possessing antimicrobial properties
- Alleviating inflammation and pain
- Enhancing collagen production
- Providing antioxidant support

- Being safe and cost-effective
- Having minimal side effects

Herbal Plant in the Formulation.

1. *Tridax Procumbens*

Tridax procumbens, also known as coat buttons, is a medicinal herb from the Asteraceae family. It is highly valued in traditional medicine for its healing properties, such as aiding in wound recovery, combating microbes, reducing inflammation, and boosting collagen production.

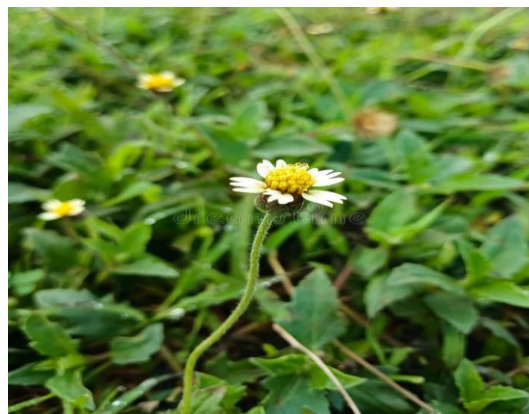


Fig No. 1: *Tridax Procumbens*^[10,16,21] Linn.

Plant Profile

Family: Asteraceae

Genus: *Tridax*

Species: *Tridax Procumbens* Linn^[10,16,21]

Common Name: Coat Buttons, Ghamara and Kansari

Active Components: Flavonoids, Alkaloids, Carotenoids, Saponins, Tannins, Steroids, Triterpenoids.

2. *Lantana Camara*^[7,13] Linn

Lantana camara^[7,13], a member of the Verbenaceae family, is a beautiful flowering plant commonly used in traditional medicine for treating wounds and skin infections. It is known for its antibacterial properties that aid in preventing infections, promoting faster healing, and reducing swelling and inflammation.

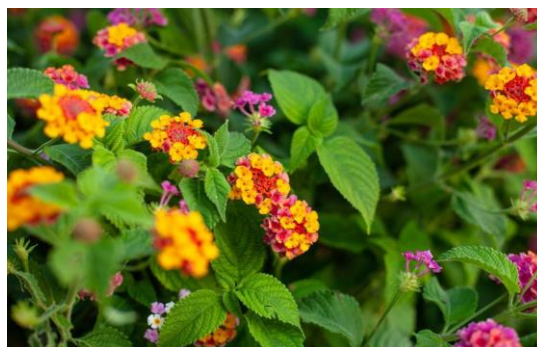


Fig No.2: *Lantana Camera* Linn.

Plant Profile

Family: Verbenaceae

Genus: *Lantana* Species: *Lantana Camara*^[7,13]

Common Name: Lantana, Wild Sage, Bahama Tea.
Active Components: Triterpenes, Flavonoids, Phenylpropanoids, Terpenoids, Essential Oil.

3. Aloe Vera^[9,18]

Aloe vera,^[9,18] a well-loved healing plant belonging to the Liliaceae family, is famous for its beneficial properties. The gel obtained from its leaves helps hydrate wounds, boost collagen formation, decrease inflammation, and accelerate tissue healing.



Fig No. 3: Aloevera.

Plant Profile

Family: Asphodelaceae

Genus: Aloe

Species: Aloe Vera^[9,18]

Common Name: Aloe Vera,^[9,18] True aloe

Active Components: Polysaccharides, Phenolic Compounds, Enzymes, Vitamins, Minerals

4. Neem^[4,9,16]

Neem, a plant known for its medicinal properties and belonging to the Meliaceae family, is commonly used to treat skin conditions and infections.



Fig No. 4: Neem.^[4,9,16]

Plant Profile

Family: Meliaceae

Genus: Azdirachta

Species: Azdirachta Indica

Common Name: Neem,^[4,9,16]

Active Components: Triterpenoids, Flavonoids, Tocopherol Alkaloids Polyphenolics.

Preparation Method

1. Lantana Camara Extraction^[7,13] (For 50g ointment).

- Gather fresh Lantana camara^[7,13] leaves and wash them with distilled water.
- Dry the leaves in the shade and grind them into powder.
- Extract the powdered leaves using ethanol with a.



Fig.No.5: Extraction of Lantana.

Soxhlet Apparatus.

- Filter and concentrate the extract through evaporation.
- Store the obtained extract for formulation.

2. Tridax Procumbens Extraction (For 50g ointment).

- Collect fresh leaves and clean them.
- Dry the leaves in the shade and grind them into powder.
- Extract the powder using ethanol with a Soxhlet Apparatus.
- Filter and concentrate the extract.

3. Neem^[4,9,16] Extraction (For 50g ointment)

- Collect fresh neem^[4,9,16] leaves and clean them.
- Dry the leaves in the shade and grind them into powder.
- Extract the powder using ethanol with a Soxhlet Apparatus.
- Filter and concentrate the extract.

4. Aloe Vera^[9,18] Gel Collection.

The essence was carefully stored for later use. To make a 50g Aloe Vera^[9,18] cream, we gathered fresh aloe vera^[9,18] leaves and carefully removed the outer green layer to extract the inner gel. After filtering out any fibres, the pure gel was then used in the cream-making process.



Fig No.6: Extraction of Herbs.

Ointment Preparation Method

1. For the ointment formulation, we first melted stearic acid and petroleum jelly at around 70°C to create the oil phase.
2. At the same time, in a separate container, we warmed up a mixture of purified water, glycerine, and triethanolamine to the same temperature to form the aqueous phase.
3. Gradually, the aqueous phase was added to the oil phase while continuously stirring.
4. We then included herbal extracts of Tridax procumbens, Lantana camara^[7,13], Aloe vera,^[9,18] and Neem.^[4,9,16]

5. Stirring was maintained until a smooth and consistent cream was achieved.
6. The final ointment was cooled, packed into suitable container, and underwent evaluation.
7. During physical evaluation, the ointment was examined for colour, scent, texture, and overall appearance.
8. Spread ability was tested by sandwiching a small amount of ointment between two glass slides and measuring the spread diameter under pressure.

Formulation Table

Sr. No.	Ingredients	F 1	F 2	F 3	F 4
1	Tridax Procumbens	1	1.5	1	1
2	Lantana Camara Linn	0.5	1	1	1
3	Neem	0.5	1	1	1
4	Aloevera	1	1.5	2	2
5	Petroleum Jelly	32.5	32.5	32.5	32.5
6	Glycerine	1	2	3	4
7	Steric Acid	5	5	5	5
8	Triethanolamine	0.5	0.5	1	1
9	Purified Water	Q.S	Q.S	Q.S	Q.S

Formula 1: Failed

Reason: The ointment formula exhibited low consistency, poor spreadability,^[20,26] and was less oily, making it unsuitable for the formulation.



Fig. No 7: Batch 1.

Formula 2: Failed

Reason: The ointment formula showed pleasant Smell and making it unsuitable for the formulation.



Fig.No 8: Batch 2.

Formula 3: Failed

Reason: The ointment formula showed increased spreadability^[20,26] but contained coarse particles, was highly oily, and had a highly acidic pH, making it unsuitable for the formulation.



Formula 4: Successful.

Reason: The ointment formula performed well in evaluation, displaying high spreadability,^[20,26] good consistency, optimal pH levels, absence of coarse particles, and proper mixing. It was thus selected for the cream formulation.



Fig. No 9: Batch 4.

Batch Results



Fig no 10: Batch 1,2,3,4.

Evaluation Parameters

1. pH Test

We used a digital pH meter to measure the ointment's pH, ensuring its quality. The pH level is 6.2.



Fig No.11: pH Test.

2. Homogeneity

A visual inspection was conducted to check the homogeneity of the formulation, ensuring even distribution of all ingredients. It shows good homogeneity.

3. Washability

To test washability, we applied the ointment to the skin and washed it off to see how easily it could be removed. It has easy washability.

4. Consistency

We evaluated the ointment's consistency by looking at its thickness and smoothness. The formulation was monitored for several days to check for phase separation. It shows a semi-solid consistency with no phase separation.

5. Irritancy

An irritancy test involved applying the ointment to the skin and observing for redness, irritation, or swelling. It is non-irritant.

6. Color

The ointment has a light green color.

7. Texture

It has a smooth texture.

8. Stability^[20]

Thermal stability^[20] was assessed by storing the formulation at different temperatures. It shows stable thermal stability.^[20]

9. Spreadability^[20,26]

The spreadability^[20,26] is measured at 5-6 cm.



Fig No.12: Spreadability.

RESULT

The present study successfully formulated and evaluated a polyherbal wound healing ointment containing extracts of *Tridax procumbens*, *Lantana camara*, *Aloe vera*, and *Azadirachta indica* (Neem). Three different formulations (F1, F2, F3 and F4) were prepared and subjected to various physicochemical evaluation parameters. Among all the formulations, F4 was found to be the most suitable and effective based on its overall performance. The prepared ointment exhibited a smooth, uniform, and semi-solid appearance with a pleasant light green color and characteristic odor. The pH of the formulation was found to be 6.2, which lies near the acceptable range (4.5–6.0) for topical preparations and is considered suitable for skin application. The formulation showed good homogeneity without the presence of lumps or

phase separation, indicating uniform distribution of the ingredients. The spreadability of the ointment was observed to be 5–6 gm.cm/sec, demonstrating ease of application on the skin surface. The consistency of the ointment was found to be ideal, possessing a balanced semi-solid nature that was neither excessively greasy nor too dry. The washability test indicated that the formulation could be easily removed with water, thereby improving patient convenience and hygiene. The irritancy study revealed no signs of redness, itching, or inflammation, confirming that the ointment was non-irritant and safe for topical application. Furthermore, the stability study demonstrated that the formulation remained stable under different temperature conditions without showing any significant changes in physical appearance or other properties. Overall, the results suggest that formulation F3 possesses satisfactory physicochemical characteristics and can be considered a promising polyherbal wound healing ointment.

DISCUSSION

In this study, we focused on creating and testing a polyherbal ointment for wound healing. The ointment, made from *Tridax procumbens*, *Lantana camara* Linn., *Aloe vera*, and *Neem* extracts, was evaluated through various formulations. Formulation F3 emerged as the most promising, showing excellent spreadability, consistency, homogeneity, pH levels, washability, and stability. It displayed a pleasing physical appearance and did not cause any skin irritation, indicating its suitability for topical use. The herbal ingredients exhibited antimicrobial properties, potentially aiding in preventing infections and accelerating the healing process. *Aloe vera* provided moisturizing and soothing effects, while *Neem* and *Lantana camara* offered antimicrobial and anti-inflammatory benefits. *Tridax procumbens* supported tissue regeneration and collagen formation. This study highlights the benefits of combining multiple herbal extracts to boost wound healing and enhance the therapeutic effectiveness of the ointment. The polyherbal ointment developed in this research shows promise as a cost-effective herbal solution for wound care.

CONCLUSION

In our research, we dedicated our efforts to developing and testing a polyherbal ointment specifically for treating wounds. This ointment, crafted using extracts from *Tridax procumbens*, *Lantana camara*^[7,13], *Aloe vera*^[9,18], and *Neem*,^[4,9,16] was successfully created with the right combination of ingredients. Through evaluation studies, we confirmed that this formulation exhibited favorable physical characteristics, maintained appropriate pH levels, had good spreadability,^[20,26] and did not show any phase separation. Moreover, the ointment displayed antimicrobial properties and proved to be gentle on the skin. These findings indicate that the polyherbal ointment could serve as a safe and effective choice for topical wound healing^[1,2] treatments. For those interested in delving deeper, additional resources for reading include works by Kokate CK, Purohit AP, Gokhale SB,

Harborne JB, Trease, Evans, Sharma PP, and the Indian Herbal Pharmacopoeia.

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