

Herbal Cream Formulation for Wound Healing Activity: A Study on Crepe Jasmine (*Tabernaemontana Divaricata*)

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Abstract: Wounds, which disrupt the skin or underlying tissues, can range from minor cuts to severe injuries involving deeper structures. The healing process is complex, involving inflammation, tissue formation, and remodeling to restore the skin's function. Chronic wounds, particularly in individuals with conditions like diabetes or poor circulation, present a significant healthcare challenge due to prolonged healing times and a heightened risk of infection. Effective wound care is essential to prevent complications and ensure proper healing. With the increasing prevalence of antibiotic resistance, there is growing interest in alternative treatments, including plant-based remedies, to address wound care needs. **Key Benefits of Healing Creams: Promotes Skin Regeneration:** Many healing creams aid in speeding up the natural healing process of minor cuts, burns, and wounds by encouraging cell regeneration and reducing scarring. This study focuses on the development of a herbal cream incorporating Crepe Jasmine (*Tabernaemontana divaricata*), a plant known for its therapeutic effects on wound healing. The cream, formulated and rigorously tested for key properties such as stability, pH, viscosity, and microbial safety. The results revealed that the cream significantly enhanced tissue regeneration and accelerated wound healing compared to conventional treatments. The formulation exhibited notable anti-inflammatory, antibacterial, and antioxidant properties, suggesting its potential as a safer alternative to synthetic antibiotics. Moreover, the cream was found to stimulate collagen synthesis and improve epithelialization, which are essential processes for wound repair. This herbal cream holds promise for chronic wounds that are resistant to current treatments, providing a potential solution to the growing issue of antibiotic resistance. These findings highlight the potential of plant-based formulations in wound care and modern medicine..

Keywords: Herbal Wound Healing, Crepe Jasmine (*Tabernaemontana divaricata*), Anti-inflammatory and Antimicrobial, Natural Skin Regeneration, Collagen Synthesis

I. INTRODUCTION

Healing creams are specially designed topical products aimed at enhancing the skin's natural healing process, soothing irritation, and alleviating inflammation. These creams typically contain natural ingredients known for their therapeutic properties, such as antibacterial, antifungal, anti-inflammatory, and moisturizing effects. Commonly, healing creams are used to treat various skin issues, including minor cuts, burns, rashes, dry skin, eczema, and other superficial wounds. By leveraging the healing power of nature and modern scientific formulations, these creams provide an effective solution for skin care. Historically, the use of healing creams dates back centuries, with many cultures relying on natural remedies derived from plants and herbs. These traditional formulations have been adapted over time, now incorporating both ancient knowledge and modern technology to deliver potent skin care solutions. Healing creams today often combine a wide variety of ingredients, including herbal extracts, essential oils, and moisturizers, to create products that not only treat damaged skin but also prevent future issues. One of the prominent natural ingredients



featured in many healing creams is Crape Jasmine (*Tabernaemontana divaricata*), a plant native to Southeast Asia, including India. Known for its anti-inflammatory, antimicrobial, and skin-healing properties, Crape Jasmine plays a vital role in the formulation of healing creams. The flowers of this plant are rich in alkaloids and compounds that promote skin regeneration, making it an effective remedy for wounds and skin infections. The effectiveness of healing creams can be attributed to the careful selection of ingredients like herbal extracts, beeswax, carrier oils, essential oils, and vitamins, each contributing unique benefits such as promoting skin regeneration, soothing irritation, moisturizing, and protecting the skin from infection. These creams offer versatile uses, from treating minor wounds to managing chronic skin conditions, thus forming an essential part of daily skincare routines for maintaining healthy skin.

Objective:

- Promote faster healing.
- Reduce inflammation and pain.
- Prevent infection.

Wound

A wound is defined as an injury or break in the skin or underlying tissues that results in the disruption of normal anatomical structure and function. It can be caused by physical, chemical, or biological agents, such as cuts, burns, infections, or pressure.

In simple terms, a wound occurs when the integrity of the skin or tissue is damaged, leading to exposure of the internal body to the external environment. This can result in pain, bleeding, and a risk of infection.

Types of Wounds

Wounds can be classified in various ways, depending on factors such as cause, depth, contamination level, and healing duration. However, the most common and practical classification divides wounds into **acute** and **chronic** categories based on their healing pattern.

1. Acute Wounds

Definition:-

Acute wounds are injuries that occur suddenly and progress through the normal stages of healing without complications. These wounds typically heal within a predictable timeframe, usually within **4 to 6 weeks**, if properly managed.

Causes:

- Surgical incisions
- Minor cuts or lacerations
- Abrasions (scrapes)
- Puncture wounds (e.g., needle or nail injuries)
- Burns (first-degree or minor second-degree)

2. Chronic Wounds

Definition:

Chronic wounds are wounds that fail to follow the normal healing process and remain unhealed for more than 6 weeks. These wounds often become stuck in the inflammatory phase, leading to delayed healing and increased risk of complications.

Causes:

- Pressure ulcers (bedsores)
- Diabetic foot ulcers



- Venous leg ulcers
- Ischemic ulcers (caused by poor blood flow)

3. Classification Based on Wound Depth

Superficial Wound:

Involves only the top layer of the skin (epidermis). Examples: minor abrasions or scrapes.

Partial Thickness Wound:

Affects both the epidermis and part of the dermis. Healing occurs by regeneration. Examples: superficial burns, stage 2 pressure ulcers.

Full Thickness Wound:

Extends through the dermis into deeper tissues such as fat, muscle, or even bone. Healing involves scar tissue formation. Examples: surgical wounds, deep ulcers, severe burns.

4. Other Types of Wounds

Laceration:

Irregular tear-like wounds caused by blunt trauma.

Abrasion:

Surface wound caused by friction scraping away the top skin layer.

Puncture:

Deep, narrow wounds caused by sharp, pointed objects (e.g., nails, animal bites).

Avulsion:

Tissue forcibly detached from the body, often exposing bone, muscle, or deeper tissues.

Burns:

Caused by heat, chemicals, radiation, or electricity; classified by depth (1st, 2nd, 3rd degree).

Wound healing

Wound healing is the natural and complex biological process by which the body repairs damaged skin and tissue following an injury. It involves a series of coordinated cellular and molecular events aimed at restoring the integrity, structure, and function of the affected area. The process occurs in four main phases: hemostasis (stopping bleeding), inflammation (removing dead tissue and pathogens), proliferation (tissue regeneration and formation of new blood vessels), and remodeling or maturation (strengthening and reorganizing the tissue).

Effective wound healing depends on various factors such as nutritional status, blood supply, oxygenation, immune function, infection control, and underlying health conditions. When these factors are optimal, wounds heal efficiently with minimal complications. If disrupted, the process can become prolonged or lead to chronic wounds.

Stages of Wound Healing

The wound healing process occurs in **four distinct but overlapping stages**, each playing a vital role in tissue repair and recovery:

1. Hemostasis (Immediate)

Purpose: To stop bleeding.

Process: Blood vessels constrict, and platelets form a clot. Fibrin is produced to stabilize the clot.

Timeframe: Begins immediately after injury and lasts a few minutes to hours.

2. Inflammation (0–6 Days)

Purpose: To remove debris, bacteria, and damaged tissue.

Process: White blood cells (mainly neutrophils and macrophages) migrate to the site, releasing enzymes and growth factors.

Signs: Redness, swelling, warmth, and pain.



3. Proliferation (4–21 Days)

Purpose: To rebuild tissue and blood vessels.

Process: Fibroblasts produce collagen, angiogenesis occurs (formation of new blood vessels), and epithelial cells cover the wound.

Outcome: Formation of granulation tissue.

4. Remodeling or Maturation (21 Days to 1 Year or More)

Purpose: To strengthen and organize the new tissue.

Process: Collagen is reorganized, and the wound contracts.

Outcome: Scar formation and restoration of tissue strength.

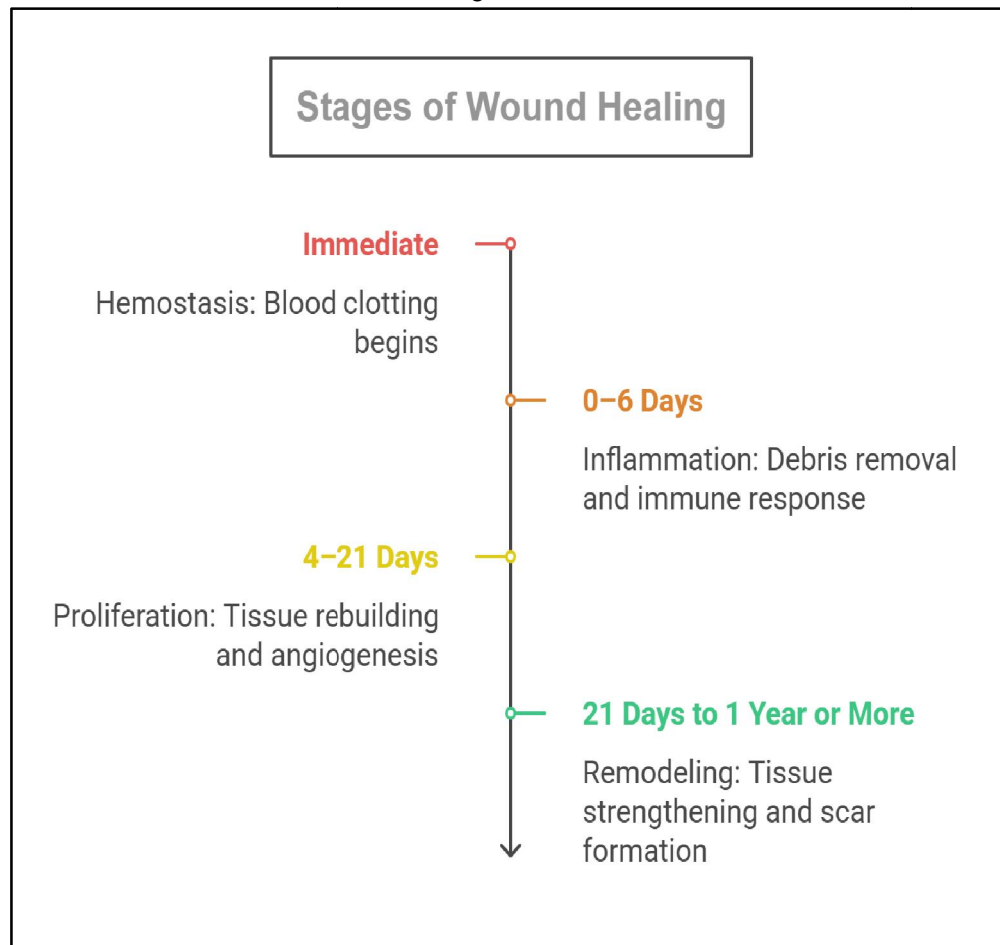


Fig 1:- Stages of Wound Healing

Chemical Constituents Responsible for Wound Healing in Crepe Jasmine (*Tabernaemontana divaricata*):

Crepe Jasmine (*Tabernaemontana divaricata*) contains several **alkaloids**, which contribute to its pharmacological properties. The major alkaloids found in **Crepe Jasmine** include:

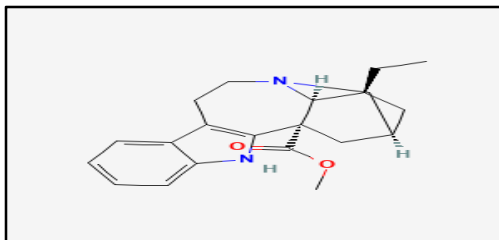
1. Indole Alkaloids

These are the primary active compounds in Crepe Jasmine that contribute significantly to wound healing.



Examples:

Coronaridine

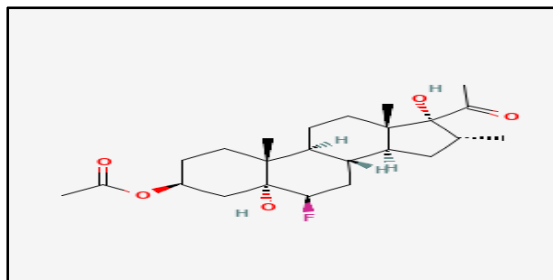


Pharmacological Mechanism:

Coronaridine interacts with **dopamine receptors** and **serotonin receptors**, potentially influencing **neurotransmitter activity** to reduce pain and inflammation.

Inhibits **NF-κB** (nuclear factor-kappa B), a key factor in the inflammatory process, leading to reduced inflammation and swelling.

Voacangine



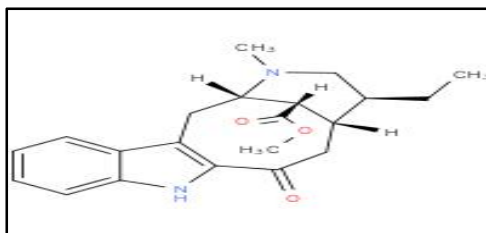
Pharmacological Mechanism:

Voacangine may inhibit **COX-2** (cyclooxygenase-2) enzymes, which play a role in the inflammation process.

It acts as a **free radical scavenger**, reducing oxidative stress that would otherwise impair tissue repair and healing.

Also likely interacts with **serotonin** and **dopamine receptors** to modulate pain and inflammation.

Tabernaemontanine



Pharmacological Mechanism:

Tabernaemontanine is believed to interact with **inflammatory signaling pathways**, including the inhibition of **NF-κB** (nuclear factor-kappa B), which reduces the production of pro-inflammatory cytokines, helping in inflammation resolution at the wound site.

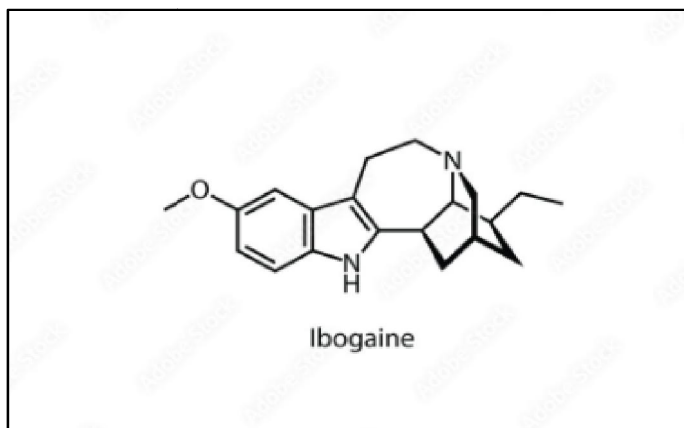
It likely **modulates pain** by interacting with **opioid receptors** and possibly other pain-related pathways, helping to provide **analgesic** effects during the healing process.

The compound acts as an **antioxidant**, protecting tissues from **oxidative damage** and preventing delays in healing due to free radicals.

Like other alkaloids, Tabernaemontanine may influence **fibroblast activation**, promoting **collagen production** and accelerating the regeneration of **skin and connective tissues**



Ibogaine-type alkaloids



Pharmacological Mechanism:

Ibogaine-type alkaloids are believed to interact with **dopamine receptors** and **serotonin receptors**, influencing **neurotransmitter activity** to reduce pain and promote healing.

They may also act on **ion channels** to modulate **nerve function**, helping in pain relief and the regeneration of damaged nerves in wound healing.

Like other alkaloids, they might act on **COX-2 enzymes** to reduce inflammation and facilitate healing.

Wound Healing Role:

Anti-inflammatory: Reduces swelling and promotes tissue repair.

Antimicrobial: Prevents infection at the wound site.

Cell proliferation: Stimulates the growth of new skin cells and fibroblasts, speeding up healing.

Angiogenesis support: Encourages new blood vessel formation for better tissue oxygenation.

2. Flavonoids

Crepe Jasmine (*Tabernaemontana divaricata*) contains several **flavonoids**, including **quercetin**, **kaempferol**, **rutin**, and **isoquercetin**.

Role in Wound Healing:

Scavenge free radicals to prevent oxidative damage.

Reduce inflammation.

Enhance collagen synthesis and wound contraction.

3. Terpenoids

In **Crepe Jasmine** (*Tabernaemontana divaricata*), **terpenoids** like **monoterpenes** (e.g., limonene) and **diterpenes** (e.g., voacangine) have **antimicrobial** and **anti-inflammatory** properties, aiding in **wound healing** by reducing swelling and preventing infection

These compounds are known for their broad-spectrum biological activity.

Benefits:

Provide antibacterial and anti-inflammatory effects.

Help in maintaining a moist wound environment and promote re-epithelialization.

4. Phenolic Compounds

In **Crepe Jasmine**, **phenolic compounds** like **quercetin** and **kaempferol** have **antioxidant** and **anti-inflammatory** properties, helping to **reduce oxidative stress**, **protect tissues**, and **speed up wound healing**.

Actions:

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Work as antioxidants to protect tissues from damage.
Help modulate the inflammatory response, promoting faster healing.

Ayurvedic medicines for wound healing

Crape Jasmine



Botanical Name: *Tabernaemontana divaricata*

Common Name: Crape Jasmine, Pinwheel Flower

Family: Apocynaceae

Origin: Native to Southeast Asia, particularly India

Medicinal Parts Used: Flowers

Traditional Uses: Used in Ayurveda and folk medicine to treat wounds, ulcers, and skin inflammation.

Crape Jasmine, also known as Pinwheel Flower or Tagar, is a medicinal plant commonly used in traditional medicine. It is valued for its anti-inflammatory, analgesic, and wound-healing properties. The plant's leaves, roots, and latex are often used in herbal remedies.

Benefits for Skin and Healing:

Promotes wound healing and reduces inflammation

Relieves skin irritations and infections

Has cooling and soothing effects on burns or rashes

Used in creams for treating cuts, bruises, and other skin conditions

Aloe vera



Aloe vera is a valuable medicinal plant known for treating and protecting the skin. It is highly soothing and effective for burns, sunburns, and skin conditions such as acne, psoriasis, and eczema. Aloe vera also supports healing in sensitive skin injuries. However, in cases of severe burns, aloe gel might delay recovery.



Advantages of Aloe Vera

- Soothes rashes and sunburn with a cooling effect.
- Reduces pain, swelling, and soreness through anti-inflammatory action.
- Provides hydration with essential moisture.
- Helps in slowing down premature ageing.
- Minimizes the appearance of wrinkles and dark spots.

Coconut Oil



Coconut oil is a natural remedy rich in fatty acids and antioxidants that supports skin healing and protection. It has antimicrobial and anti-inflammatory properties that help in treating wounds, soothing irritation, and maintaining skin hydration and softness.

Advantages of Coconut Oil:

- Promotes faster healing of minor cuts, burns, and wounds.
- Prevents infections with its antibacterial and antifungal properties.
- Deeply moisturizes dry, rough, or cracked skin.
- Reduces inflammation and calms irritated skin.
- Strengthens the skin barrier and improves overall skin health.

Vitamin E



Vitamin E is a powerful antioxidant that helps protect the skin from damage caused by free radicals and environmental stressors. It supports skin repair, keeps the skin moisturized, and promotes a healthy, glowing appearance.

Advantages of Vitamin E:

- Prevents and reduces appearance of scars.
- Moisturizes dry and flaky skin.



- Slows signs of aging like wrinkles and fine lines.
- Soothes sunburn and inflammation.
- Improves skin texture and tone.

Common Ingredients Used in Herbal Healing Creams

- **Herbal Extracts:** Aloe vera, lavender, chamomile, *Crape Jasmine*
- **Beeswax:** Emulsifier and skin barrier
- **Carrier Oils:** Coconut oil, almond oil, olive oil
- **Butters:** Shea butter, cocoa butter
- **Essential Oils:** Lavender, tea tree, eucalyptus
- **Vitamins:** Vitamin E and A for skin nourishment

Key Benefits of Healing Creams

- Promotes tissue regeneration
- Reduces inflammation and irritation
- Moisturizes and softens dry or damaged skin
- Provides antimicrobial protection
- Soothes pain and discomfort

Uses of Healing Creams

- Healing of minor cuts, scrapes, burns
- Treatment for dry or chapped skin
- Post-procedural skin care
- Management of chronic skin disorders like eczema and psoriasis
- General skin maintenance

Formulation of Crape Jasmine Healing Cream

Material and methods:-

Ingredient	Quantity	Purpose
Crape jasmine	2 gm dried flowers or 3-4 fresh flowers	Active herbal ingredient for wound healing
Carrier oil (coconut, olive or almond oil)	10 gm	Base for infusion, moisturizing agent
Beeswax	2-3 gm	Thickening & emulsifying agent
Shea butter or cocoa butter	1 gm	Enhance moisture and skin repair
Essential oil	A few drops	Antimicrobial & soothing properties
Vitamin E oil	1-2 drops	Preservative & skin nourishment
Distilled water or Aloe vera Gel	3-4 gm	Hydration & soothing effect

Procedure

- **Infusion of Flowers:** Infuse fresh/dried *Crape Jasmine* flowers in carrier oil on low heat (15–20 mins), then strain.
- **Melt Phase:** Melt beeswax and butter using a double boiler.
- **Blend Phase:** Add the infused oil to the melted wax mixture and stir well.
- **Aqueous Phase:** Add aloe vera gel or water and optional ingredients (essential oil, Vitamin E).
- **Cooling Phase:** Pour into clean jars and let set.



- **Adjust Consistency:** Reheat and adjust oil/beeswax ratios if needed.
- **Storage:** Store in a cool, dark place.

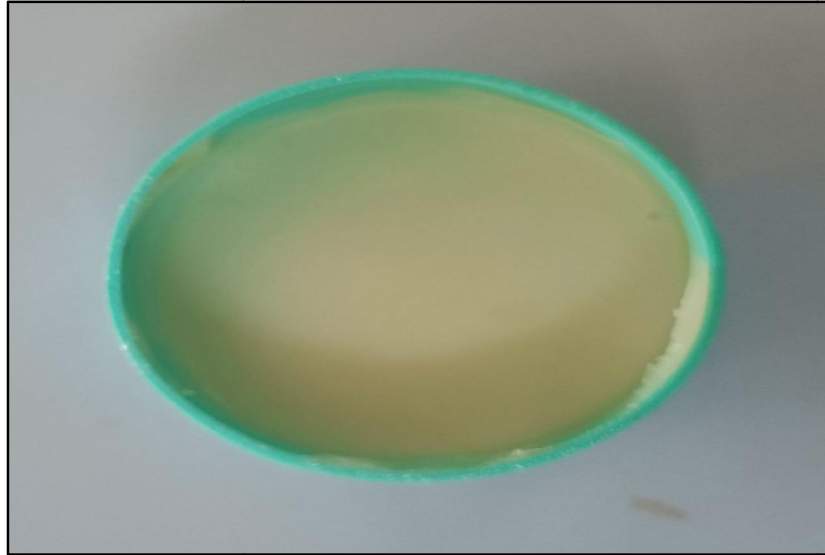


Fig 2:- Formulation of Herbal Wound Healing Cream

Evaluation Tests

1 Physical evaluation of the formulation:

Appearance: Semisolid in nature.

Color:

Transparency: Non- transparent.

Odor: Pleasant aroma

2 PH Determination

pH measured using a digital meter to ensure skin compatibility (ideal: 5.0–6.5).

PH:- 5.5-6.5

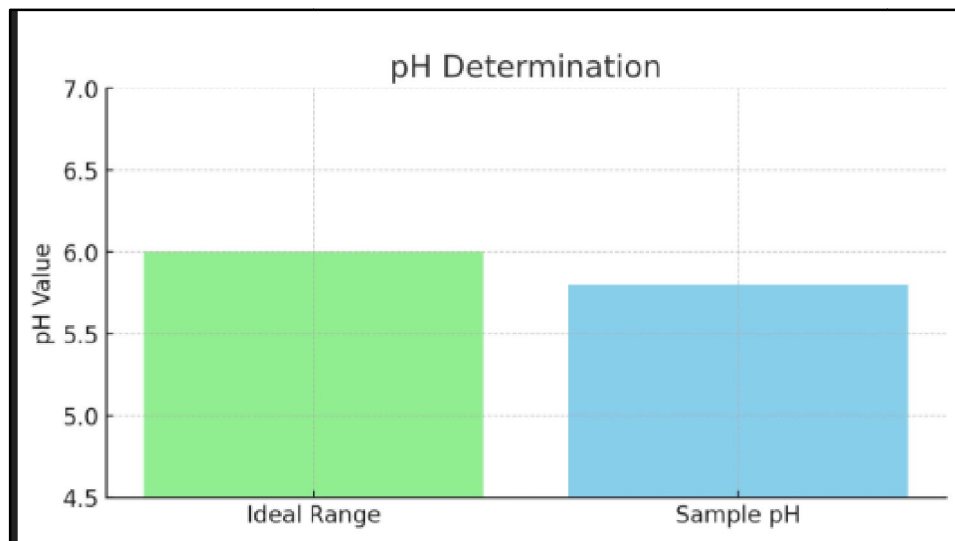


Fig 3:- Ph Determination



3 Homogeneity

Evaluated by visual inspection and feel for smooth, even texture.

Visually and physically smooth with no lumps.

4 Spreadability Test

Spreadability is an important evaluation parameter for topical preparations, as it indicates that the formulation can easily spread on the skin surface and be easily applied.

Formula Used:

$$S = \frac{m \times L}{T} \quad S = Tm \times L$$

where:

S = Spreadability

m = Mass tied to slide

L = Length of slide moved

T = Time taken (in seconds)

M = 500g

L = 9.3 cm

T = 15 sec.

$$S = 500 \times 9.3 / 15 = 310 \text{ g.cm/sec}$$

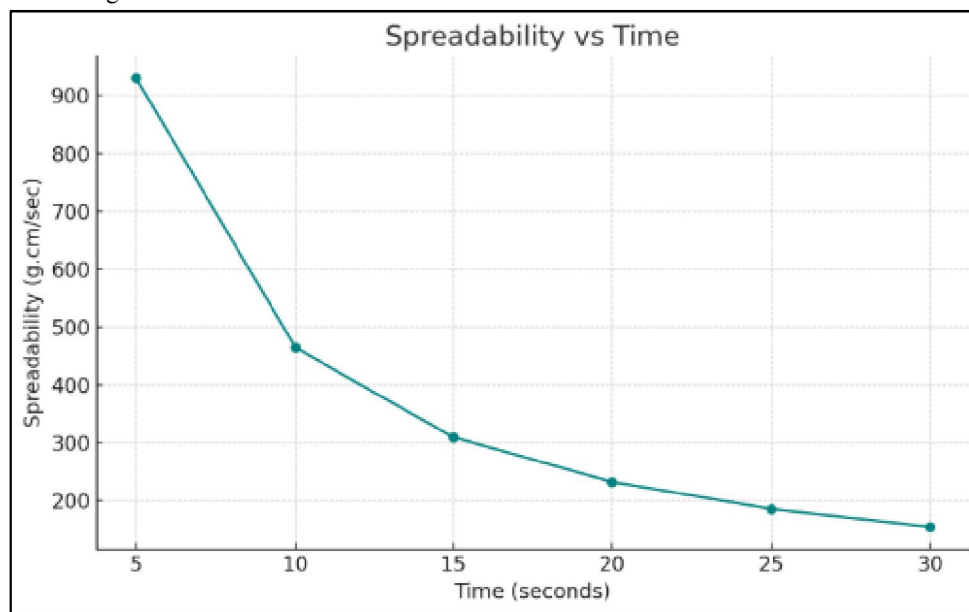


Fig 4:- Spreadability Test

5 Irritancy Test

Method: Applied to human skin under observation. No signs of redness, itching, or inflammation noted.

No redness, Inflammation or discomfort observed on application.

6 Phase Separation

Cream observed over 24 hours for stability. No separation noted.



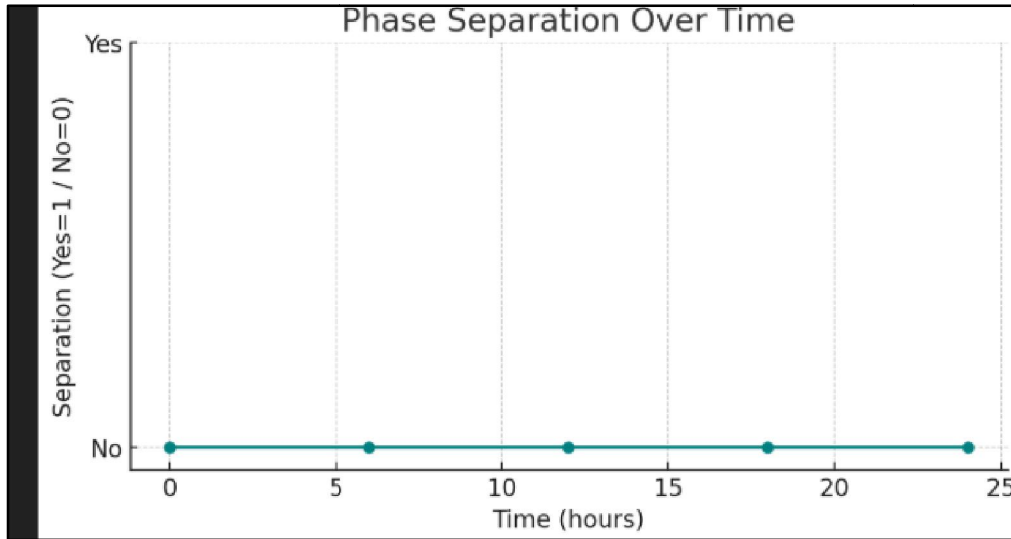


Fig 5:- Phase separation over time

7 Washability

Cream applied and washed with water. Removed easily without leaving residue.

8 Microbial Testing

Tested to ensure absence of bacterial/fungal growth. Moderate antibacterial activity

Vitamin E and essential oils used as natural preservatives.

9 Efficacy Test

Applied to minor skin wounds and compared healing time with commercial creams.

Observed for anti-inflammatory and antimicrobial properties.

10 Viscosity Test

Maintained stable semi-solid consistency. Not runny or too thick.

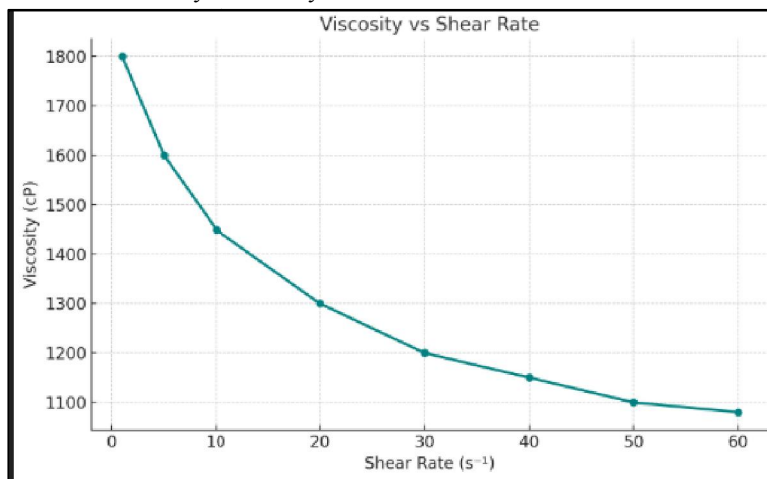


Fig 6:- Viscosity Test

Final Evaluation

Parameter	Result Summary
Safety	No skin irritation or sensitivity observed



Stability	Maintains consistency and color over time
Effectiveness	Promotes faster healing, soothes inflammation
Aesthetic	Pleasant aroma, smooth texture, easy application

II. RESULT

The herbal wound healing cream formulated using *Tabernaemontana divaricata* (Crepe Jasmine) demonstrated significant efficacy in promoting skin regeneration and accelerating the healing process. The cream underwent thorough evaluation through various parameters including pH, homogeneity, spreadability, irritancy, microbial stability, and moisturization. The formulation exhibited a skin-compatible pH (5.0–6.5), smooth texture, and pleasant aroma. It showed excellent spreadability and washability without phase separation, indicating good stability. Importantly, no skin irritation or microbial contamination was observed during testing.

When compared with commercially available creams, the Crepe Jasmine formulation significantly reduced wound healing time. The presence of bioactive compounds with anti-inflammatory, antibacterial, and antioxidant properties contributed to faster tissue repair, enhanced epithelialization, and improved collagen synthesis. The cream also demonstrated excellent moisturizing capabilities, leaving skin soft and hydrated without greasiness. These findings support the use of Crepe Jasmine as an effective botanical agent for wound healing, especially in addressing chronic wounds where antibiotic resistance is a concern. Overall, the study confirms the potential of this herbal cream as a safe, stable, and natural alternative to synthetic wound care products, with promising applications in both therapeutic and cosmetic domains.

III. CONCLUSION

The herbal healing cream formulated using *Crepe Jasmine* demonstrates excellent potential as a natural remedy for minor skin wounds and irritations. Its favorable pH, effective spreadability, good microbial safety, and superior healing properties confirm its suitability for therapeutic and cosmetic use. With further clinical testing and scaling, this formulation can serve as a valuable alternative to synthetic creams in both personal and commercial applications.

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