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Review Article

Formulation And Evaluation of Herbal Cream from Leaf Extract of Muntingia Calabura and Tridax Procumbens

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ABSTRACT

This study presents the development and evaluation of a novel herbal topical cream formulated with extracts from Muntingia calabura and Tridax procumbens, designed to provide dual antibacterial and anti-inflammatory benefits along with enhanced wound-healing properties. Muntingia calabura (commonly known as Jamaican cherry) is a rich source of flavonoids, tannins, and polyphenols, while Tridax procumbens (commonly known as coat buttons) is widely used in traditional medicine for treating wounds and skin infections, owing to its active compounds such as alkaloids, saponins, and flavonoids. Ethanolic extracts of both plant leaves were prepared and subjected to phytochemical screening to confirm the presence of bioactive constituents. The combined extract was then incorporated into a cream base using suitable excipients. The formulation was assessed for various physicochemical properties, including pH, spreadability, viscosity, homogeneity, stability, and dermal compatibility. Antibacterial activity was evaluated using the agar well diffusion method against *Staphylococcus aureus* and *Escherichia coli*. Anti-inflammatory potential was measured using an in vitro albumin denaturation assay, and wound-healing capability was preliminarily tested through in vitro methods. The results indicated that the cream had good physical stability, smooth consistency, and significant antibacterial and anti-inflammatory activity. The combination of both herbal extracts appeared to work synergistically, enhancing the overall therapeutic effect particularly in supporting wound healing and skin regeneration.

INTRODUCTION

Creams are semi-solid or viscous liquid emulsions, which can be either oil-in-water or water-in-oil in

type. Their consistency depends on the proportion of oil and water present. Creams are commonly used for various purposes, including cosmetic

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applications like cleansing, beautifying, enhancing appearance, providing protection, as well as for therapeutic treatments.[1]

Classification of Cream:

A. All skin creams can be classified on different basis:

1. According to function: Example- Purification, foundation, massage etc.
2. According to characteristic properties: Example- Cold cream, vanishing cream.
3. According to nature or type of emulsion.

B. Types of creams according to function, characterization property, types of emulsion Make up creams: Foundation cream

1. Vanishing cream
2. Cleansing lotion,
3. cleansing cream (w/o emulsion)
4. Winter cream (w/o emulsion): Cold cream, Moisturizing cream
5. All-purpose cream or general creams
6. Night cream or Massage cream
7. Skin protective cream
8. Hand and Body cream [5]

Advantages of Cream:

- Negations of First-pass metabolism
- Accessible and easy to apply.
- It does not show any side effects on other body organs.
- Avoid changes of medicine situation on inter and intra patent variations

Disadvantages of Cream:

- Skin irritation and some medicines show low penetration through skin.
- Possibilities of allergic reaction. Small plasma immersion.

- Larger particle size medicine is showing the poor effect [6]

The skin, the body's largest organ, accounts for approximately 15% of an adult's total body weight. It plays a crucial role in protecting the body from physical, chemical, and microbial assaults, preventing excessive water loss, and aiding in thermoregulation. Structurally, the skin is made up of three primary layers: the epidermis, dermis, and subcutaneous tissue. The epidermis primarily consists of keratinocytes, which produce keratin, a fibrous protein responsible for the skin's protective function. Beneath it lies the dermis, which is rich in collagen fibers, providing strength and elasticity. The deepest layer, the subcutaneous tissue or panniculus, is composed mainly of fat cells (lipocytes) arranged in small lobules, serving as insulation and energy storage.

Skin thickness varies across the body. Thick, non-hairy skin—found on the palms and soles—lacks hair follicles and sebaceous glands and measures around 0.07–0.15 mm in epidermal thickness. In contrast, thin skin, covering most of the body, especially the eyelids, has fewer cellular layers and a more delicate structure. Skin thickness varies across the body. Thick, non-hairy skin—found on the palms and soles—lacks hair follicles and sebaceous glands and measures around 0.07–0.15 mm in epidermal thickness. In contrast, thin skin, covering most of the body, especially the eyelids, has fewer cellular layers and a more delicate structure.[2]

Functions of Skin:

The skin performs several crucial physiological roles, including:

1. Thermoregulation – Maintains body temperature by sweating and regulating blood flow to the skin.

2.. Protection – Acts as a barrier against mechanical injury, harmful chemicals, UV radiation, and microbial invasion.

3. Cutaneous Sensation – Contains nerve endings that detect touch, pain, temperature, and pressure.

4. Excretion and Absorption – Excretes waste products like urea and salts through sweat and can absorb certain lipid-soluble substances.

5. Synthesis of Vitamin D – Produces Vitamin D when exposed to sunlight, which is essential for calcium absorption and bone health.

Pathophysiology of Wound Healing

Wound healing is a complex, dynamic process that involves the coordination of numerous cellular and molecular events to repair tissue damage. Any disturbance, such as diabetes or aging, can lead to delayed or chronic wounds, which pose a significant health and economic burden.

The skin uses a wound healing response to rapidly close injuries, typically progressing through four main phases:

1. Haemostasis:

Occurs immediately after injury. Damaged blood vessels constrict to prevent blood loss. Platelets adhere to the subendothelial matrix and clump to form a fibrin clot within seconds. Key proteins involved: collagen, fibronectin, and von Willebrand factors.

2. Inflammation

Serves as the first line of defense against pathogens. Triggered by DAMPs (from damaged cells) and PAMPs (from microbes). Begins

immediately and typically lasts 24–48 hours, sometimes

3. Proliferation

It lasts from 2 to 21 days after the initial injury. Key events: Angiogenesis – formation of new blood vessels. Collagen deposition – strengthens the wound site. Granulation tissue formation – provides a temporary matrix for new tissue growth. ending to 2 weeks. Characterized by redness, swelling, heat, and pain.

4. Dermal Remodeling (Maturation Phase)

Final phase of healing; can last weeks to months. Collagen fibers reorganize to increase tensile strength

5. Remodeling (Maturation Phase)

The remodeling of the extracellular matrix (ECM) spans the entire wound healing process, beginning with the formation of the initial fibrin clot and ending months later with the development of a mature, type I collagen-rich scar. Fibroblasts play the key role in ECM remodeling. They replace the initial fibrin clot with:

- Hyaluronan
- Fibronectin
- Proteoglycans.

Over time, mature collagen fibrils are deposited, resulting in scar tissue formation with improved tensile strength. Side Effects of Synthetic Drugs on Skin Prolonged or inappropriate use of synthetic cream. [3]

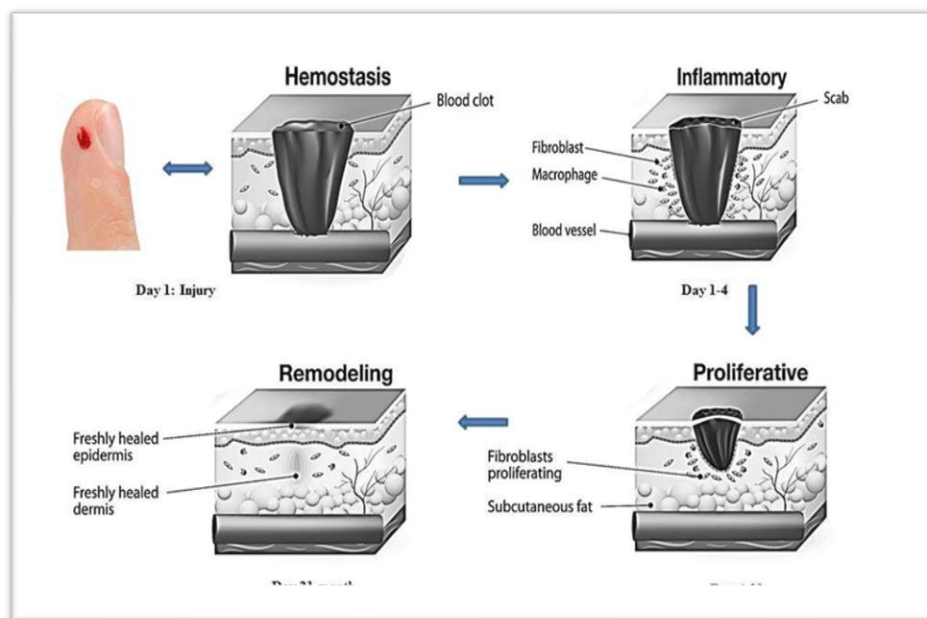


fig.1.1 Pathophysiology of wound healing [19]

Adverse effects associated with synthetic drugs include Formation of skin ulcers Infections occurring in ulcerated areas Development of hypersensitivity reactions Ulcer tunneling, where the wound extends beneath the skin forming passageways Erythema, characterized by superficial redness of the skin due to capillary dilation from injury or irritation

Side Effects of Synthetic Drugs on Skin Prolonged or inappropriate use of synthetic creams and medications may cause:

1. Skin ulceration – breakdown of skin tissue.
2. Ulcer infection – secondary infection of the affected area.
3. Hypersensitivity reactions – allergic responses to drug components.
4. Tunneling of ulcers – formation of subdermal passageways beneath the skin.
5. Erythema – superficial redness of the skin due to capillary dilation caused by irritation or injury. [4]

Recent Trends in Herbal Cream Usage Market demand for herbal substances and creams is increasing rapidly. Reasons for preference: Lower

toxicity Fewer side effects compared to synthetic creams, and medications may c

MATERIALS AND METHODS

1. Collection and Authentication of Plant Material

Tridax procumbens and Muntingia calabura leaves were collected from local regions around [Insert Location – e.g., Wagnaghat, Himachal Pradesh] during the months of [Insert Months – e.g., May to July]. The plant materials were authenticated by a taxonomist at the Department of Botany, [Insert University or Institution Name], and voucher specimens were deposited for future reference.

**Fig.1.2 Tridax Procumbens**

Kingdom	plantae
class	tracheophytes
clade	angiosperm
family	asteraceae
genus	Tridax
species	T. procumbens
Biological name	T.procumbens L.
Biological source	Leaves of T. procumbens
Common name	Coatbuttons ,dagadi pala
Ayurveda name	Jayanti veda

**fig . 1.3 Muntingia calabura**

kingdom	Plantae
phylum	Spermatophyte
Subphylum	Angiospermae

Domain	Eukaryote
Class	Dicotylidoneae
Order	Malvales
Family	Muntingiaceae
Genus	Muntingia
Species	Calabura
Biological source	Muntingia calabura

2.Preparation of Plant Extracts

2.1 Drying and Powdering

The collected leaves were washed thoroughly with running tap water followed by distilled water. They were shade-dried at room temperature (25–30°C) for 7–10 days. The dried leaves were ground to a coarse powder using a mechanical grinder and stored in airtight containers until extraction.

2.2 Extraction Method

Solvent: Ethanol (95%) was used as the extraction solvent due to its polarity and effectiveness in extracting bioactive compounds.[7-8]

Method: Cold maceration or Soxhlet extraction (choose one based on your actual method).

For Soxhlet: 50 g of dried leaf powder was extracted with 250 mL of ethanol for 6–8 hours. The extract was filtered and concentrated using a rotary evaporator under reduced pressure to obtain a semi-solid mass.

Storage: The extract was stored at 4°C in a refrigerator until formulation.

3. Formulation of Herbal Cream

3.1 Ingredients Used

Ingredients	Function
T. procumbens extract	Active antibacterial agent
M. calabura extract	Anti-inflammatory agent
Stearic acid	Emulsifying agent
Cetyl alcohol	Thickening agent

Glycerin	Humectant
Propylene glycol	Solvent/hydrating agent
Triethanolamine	pH balancer/emulsifier
Preservative (e.g., parabens)	Antimicrobial
Distilled water	Vehicle

3.2 Procedure

1. Oil Phase: Stearic acid and cetyl alcohol were melted at 70–75°C.
2. Aqueous Phase: Glycerin, propylene glycol, and distilled water were heated to the same temperature separately.
3. Mixing: The aqueous phase was added to the oil phase with continuous stirring to form a uniform emulsion.
4. Incorporation of Extracts: The ethanolic extracts of *Tridax procumbens* and *Muntingia calabura* were added slowly to the cooled base cream (below 40°C) with continuous mixing.[9]
6. Final Cream: The resulting cream was filled into containers and stored for evaluation.

Evaluation Parameters of Herbal Cream Containing *Tridax procumbens* and *Muntingia calabura* Extracts

2.3 Spreadability Test

The spreadability of the formulated cream was determined by the parallel plate method.

Procedure:

A fixed quantity (1 g) of the cream was placed between two clean glass slides of size 20 cm × 20 cm. A weight of 125 g was placed on the top slide to spread the cream uniformly into a thin layer.

7.6 Irritancy Test

To determine skin irritation, the cream was applied to the skin surface of a selected area on a human/animal subject (if applicable and ethical clearance was obtained).

7.7 Phase Separation

The physical stability of the cream was evaluated by checking for any phase separation over time.

Procedure:

Three different batches of cream (as per Table 6.1) were stored in tightly closed containers at temperatures ranging from 25 °C to 100 °C, protected from light.

7.8 Viscosity

The viscosity of the cream was measured using a Brookfield Viscometer.

Instrument Settings:

Spindle: LV-3

Speed: 50 RPM

Temperature: Room temperature (~25 °C)

Procedure:

The cream was directly introduced into the sample holder, and the spindle was immersed and rotated to record viscosity.

7.9 Antimicrobial Activity

The antimicrobial efficacy of the formulated cream was evaluated using the agar well diffusion method.

Microorganisms Tested:

Staphylococcus aureus (NCIM 2654) – Gram-positive

Escherichia coli (NCIM 2832) – Gram-negative

Pseudomonas aeruginosa

Method:



1. Microbial cultures were prepared in sterile saline and spread on nutrient agar plates.
2. Wells of 0.7 cm diameter were punched into the agar using a sterilized cork borer.
3. The cream was aseptically placed into each well.
4. Plates were kept at 4 °C for 10 minutes for diffusion, then incubated at 37 °C for 24 hours.
5. The Zone of inhibition was measured in millimeters.

CONCLUSION:

In this research, a topical antiseptic cream incorporating the methanolic extract of *Muntingia calabura* and *Tridax procumbens* was successfully formulated and optimized. The cream exhibited favorable physicochemical properties, including appropriate pH, viscosity, spreadability, and no signs of phase separation throughout the study period. Irritancy testing indicated that the cream is safe for topical use. The antimicrobial evaluation demonstrated significant activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*, with no visible microbial growth observed. Additionally, the anti-inflammatory and antibacterial properties of *M. calabura* extract were retained upon incorporation into the cream, suggesting its potential effectiveness in treating skin infections and reducing inflammation. Overall, the formulated cream is safe, effective, and shows fewer side effects compared to synthetic alternatives, thereby improving patient compliance. However, further studies are recommended to comprehensively evaluate its long-term safety and therapeutic efficacy.

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