

Formulation and Evaluation of herbal cream from leaves extract of *Muntingia calabura* and *Tridax Procumbenan*

**Rutika. M. Kharnare, Dashputre Rashmi Pravin, Baviskar Pratiksha Sunil,
Pawar Durga Aaba, Dashpute Bhavesh Prashant
K. B. H. S. S Trusts Institute of Pharmacy, Bhaygaon
Jajuwadi, bhaygaon**

ABSTRACT

The present study focuses on the formulation and evaluation of a herbal cream using natural plant extracts of *Tridax procumbens* and *Muntingia calabura*, which are known for their wound healing and skin-protective properties⁽¹⁻²⁾. The cream was prepared using the oil-in-water emulsion method, incorporating ingredients such as beeswax, liquid paraffin, borax, and methyl paraben⁽³⁾. Herbal extracts were obtained through cold maceration and added to the formulation to enhance therapeutic efficacy.⁽⁴⁾

The formulated cream was evaluated for various physicochemical parameters including color, odor, homogeneity, irritancy, washability, stability, and microbial growth⁽⁵⁾. The results indicated that the cream exhibited good consistency, pleasant odor, smooth texture, and no signs of irritation or phase separation⁽⁶⁾. Stability studies confirmed that the formulation remained stable under different conditions without any change in color or odor.⁽⁷⁾

Thus, the developed herbal cream can be considered safe, effective, and suitable for topical application, offering a natural alternative to synthetic formulations with minimal side effects.⁽⁸⁾

KEYWORDS

Herbal cream, *Tridax procumbens*, *Muntingia calabura*, wound healing, emulsion, topical formulation, physicochemical evaluation, stability study, skin protection

INTRODUCTION

Creams are semi-solid or thick liquid preparations formulated as emulsions, which may be either oil-in-water (O/W) or water-in-oil (W/O).⁽⁹⁻¹⁰⁾ The texture and thickness of creams are determined by the relative amounts of oil and water in the formulation.⁽¹¹⁾ They are widely used for cosmetic purposes such as cleansing, improving appearance, and protecting the skin, as well as for medicinal applications in treating various skin conditions.⁽¹²⁻¹³⁾

CLASSIFICATION OF CREAMS

Creams are semi-solid emulsified preparations used for cosmetic and therapeutic purposes. ⁽¹⁴⁻¹⁵⁾They can be classified based on function, characteristics, and type of emulsion.⁽¹⁵⁻¹⁶⁾

A. Basis of Classification

According to Function:

Creams are categorized depending on their intended use such as cleansing, foundation, massage, and protection.⁽¹⁷⁾

According to Characteristic Properties:

Based on their physical nature and performance, creams are classified into types like cold creams and vanishing creams⁽¹⁸⁾.

Creams may be oil-in-water (O/W) or water-in-oil (W/O) emulsions depending on the dispersion phase.⁽¹⁴⁻¹⁶⁾

According to Nature or Type of Emulsion:

B. Types of Creams

Based on function, properties, and emulsion type, creams are broadly classified as⁽¹⁵⁻¹⁷⁾

Make-up creams: e.g., foundation creams.⁽¹⁷⁾

- Vanishing creams⁽¹⁸⁾

Cleansing preparations: cleansing lotions and cleansing creams (W/O type)⁽¹⁷⁾

- Winter creams (W/O type): cold creams and moisturizing creams⁽¹⁸⁾

All-purpose or general creams⁽¹⁵⁾

Night creams or massage creams⁽¹⁷⁾

Skin protective creams⁽¹⁶⁾

Hand and body creams⁽¹⁵⁾



Fig 1 Herbal Cream⁽¹⁹⁾

ADVANTAGES AND DISADVANTAGES OF CREAMS

Advantages of Creams

- Creams bypass first-pass metabolism, thereby improving drug effectiveness.⁽²⁰⁾

- They are easy to apply and convenient for patient use.⁽²¹⁾
- They generally produce minimal systemic side effects, as their action is localized.⁽²²⁾
- Creams help reduce variability in drug absorption caused by inter- and intra-patient differences.⁽²³⁾

Disadvantages of Creams

- Some formulations may cause skin irritation or **discomfort**.⁽²⁴⁾
- There is a possibility of allergic reactions in sensitive individuals.⁽²⁵⁾
- Certain drugs show limited penetration through the skin, reducing effectiveness.⁽²⁶⁾
- Drugs with larger particle size may exhibit poor therapeutic action.⁽²⁷⁾

STRUCTURE AND FUNCTION OF SKIN

The skin is the largest organ of the human body, accounting for nearly 15% of total body weight in adults.⁽²⁸⁾ It serves as a protective barrier against physical, chemical, and microbial damage, prevents excessive water loss, and helps regulate body temperature.⁽²⁹⁾

Structurally, the skin is composed of three main layers:

- **Epidermis:**

The outermost layer, mainly composed of keratinocytes, produces keratin—a fibrous protein that provides protection and strength to the skin.⁽³⁰⁾

- **Dermis:**

Located beneath the epidermis, it contains collagen fibers that contribute to the skin's strength, elasticity, and resilience.⁽³¹⁾

- **Subcutaneous Tissue (Panniculus):**

The deepest layer, consisting primarily of fat cells (lipocytes), arranged in lobules. It functions in insulation, cushioning, and energy storage.⁽³²⁾

Variation in Skin Thickness

Skin thickness varies across different parts of the body⁽³³⁾

- **Thick skin:**

Found on the palms and soles, it is hairless and lacks sebaceous glands. The epidermis measures approximately 0.07–0.15 mm in thickness.⁽³⁴⁾

- **Thin skin:**

Present over most parts of the body, especially areas like the eyelids, it has fewer layers and a more delicate structure.⁽³⁵⁾

FUNCTIONS OF THE SKIN

The skin carries out multiple essential physiological functions that are vital for maintaining overall health and homeostasis⁽³⁶⁾

- **Thermoregulation:**

The skin helps regulate body temperature through mechanisms such as sweat production and adjustment of blood flow (vasodilation and vasoconstriction).⁽³⁷⁾

- **Protection:**

It serves as a protective barrier against external factors including mechanical injuries, harmful chemicals, ultraviolet (UV) radiation, and microbial pathogens.⁽³⁸⁾

- **Cutaneous Sensation:**

The skin contains specialized sensory receptors that enable the perception of touch, pain, temperature, and pressure.⁽³⁹⁾

- **Excretion and Absorption:**

Waste products such as urea and salts are eliminated through sweat, while certain lipid-soluble substances can be absorbed through the skin.⁽⁴⁰⁾

- **Vitamin D Synthesis:**

Upon exposure to sunlight, the skin synthesizes vitamin D, which is crucial for calcium absorption and maintaining bone health.⁽⁴¹⁾

PATHOPHYSIOLOGY OF WOUND HEALING

Wound healing is a highly coordinated and dynamic biological process involving a series of cellular and molecular events that work together to restore damaged tissue. Factors such as diabetes, ageing, and infections can disrupt this process, leading to delayed healing or chronic wounds, which represent a significant clinical and economic challenge.⁽⁴²⁾

The healing of skin wounds typically occurs through four sequential and overlapping phases:

1. Haemostasis Phase

This phase begins immediately after injury. Blood vessels constrict to minimize blood loss, and platelets aggregate at the injury site to form a fibrin clot. This clot acts as a temporary matrix⁽⁴³⁾ for cell migration.

Key components involved include collagen, fibronectin, and von Willebrand factor.⁽⁴⁴⁾

2. Inflammatory Phase

This phase acts as the body's initial defense mechanism against infection. It is triggered by signals such as damage-associated molecular patterns (DAMPs) from injured cells and pathogen-associated molecular patterns (PAMPs)⁽⁴⁵⁾ from microbes.

It usually starts within hours and may last 24–48 hours or longer, characterized by redness, swelling, heat, and pain.⁽⁴⁶⁾

3. Proliferative Phase

This stage typically occurs from 2 to 21 days after injury. It involves the formation of new tissue⁽⁴⁷⁾ and repair structures. Key processes include:

Angiogenesis: Formation of new blood vessels

Collagen deposition: Strengthens the wound

Granulation tissue formation: Provides a framework for tissue regeneration⁽⁴⁸⁾

4. Remodeling (Maturation) Phase

- This is the final stage and may last weeks to months. During this phase:

Collagen fibers are reorganized and replaced with type I collagen, increasing tensile strength⁽⁴⁹⁾

Fibroblasts play a major role in remodeling⁽⁵⁰⁾the extracellular matrix (ECM)

- The initial fibrin matrix is replaced with substances such as: Hyalurona ,Fibronectin,Proteoglycans Ultimately, a mature scar is formed⁽⁵¹⁾with improved structural integrity.

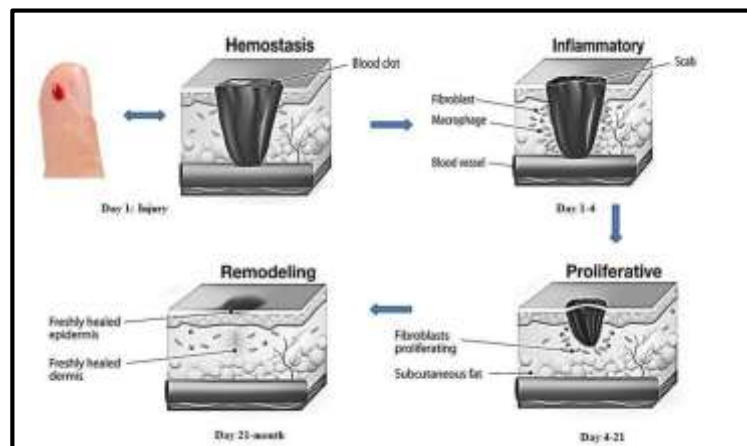


Fig 2 Pathophysiology Of Wound Healing(52)

ADVERSE EFFECTS OF SYNTHETIC DRUGS ON SKIN

1. Side Effects of Synthetic Drugs on Skin

- Synthetic drugs and topical products can cause several harmful skin reactions.
- They may lead to the formation of skin ulcers (open wounds), which damage skin tissues.
- These ulcers can slow down the healing process.
- The affected areas may easily get secondary infections, making treatment more difficult.
- Synthetic drugs can cause allergic (hypersensitivity) reactions, such as:
 - Itching
 - Swelling
 - Irritation
- In severe cases, ulcer tunneling may occur, where the wound spreads under the skin and forms channels.
- Another common effect is erythema, which means redness of the skin due to irritation or injury.
- Long-term or incorrect use of synthetic creams and medicines increases the risk of these side effects.
- Therefore, these products should be used carefully and under proper guidance.⁽⁵³⁾

MATERIALS AND METHODS

1.Collection and Authentication of Plant Material

Fresh leaves of *Tridax procumbens* and *Muntingia calabura* were harvested from nearby areas of [specify location, e.g., Wagnaghat, Himachal Pradesh] during the period of [specify months, e.g., May to July]. The collected plant specimens were taxonomically identified and authenticated by a qualified botanist from the Department of Botany, [name of institution]. Voucher samples were prepared and preserved in the departmental herbarium for future reference and verification.⁽⁶⁾



Fig.3 Tridax Procumbens

Kingdom	Plantae
Class	Tracheophytes
Clade	Angiosperm
Family	Asteraceae
Genus	Tridax
Species	T. Procumben.
Biological Name	T. Procumben.L
Biological source	Leaves of T. Procumben.L
Common name	Coatbuttons, dagadi pala
Ayurveda Name	Jayanti Veda



Fig 4 Muntingia Calabura

Kingdom	Plantae
Phylum	Spermatophyte
Subphylum	Angiosperm
Domain	Eukaryote
Class	Dicotyledone
Order	Malvales
Family	Muntingeaceae

Genus	Muntingia
Species	Calabura
Biological Source	Muntingia Calabura

2. Preparation of Plant Extract

- a. The extracts of *Muntingia calabura* leaves and *Tridax procumbens* leaves were prepared using the cold maceration technique.⁽⁵⁴⁾ About 200 g of dried and coarsely powdered plant material was taken in a conical flask, to which 500 mL of distilled water was added. The mouth of the flask was covered with a cotton plug to prevent contamination.
- b. The mixture was kept aside for 72 hours at room temperature with occasional shaking to ensure proper extraction of phytoconstituents. After maceration, the mixture was filtered using muslin cloth followed by Whatman filter paper ⁽⁵⁵⁾ to obtain a clear filtrate.
- c. The filtrate was then dried to obtain a concentrated extract.



Muntingia Calabura

Tridax Muntingia

3. Preparation of Herbal Cream

- a. All the ingredients were accurately weighed before formulation.
- b. Beeswax and liquid paraffin were taken in a borosilicate glass beaker and heated to about 75 °C until completely melted, forming the oil phase. The temperature was maintained throughout the process.
- c. In a separate beaker, borax and methylparaben were dissolved in distilled water and heated to 75 °C to obtain a clear aqueous phase.
- d. The aqueous phase was then slowly added to the oil phase with continuous stirring to form an emulsion.⁽⁵⁶⁻⁵⁷⁾
- e. After proper mixing, a measured quantity of extracts of *Muntingia calabura* leaves and *Tridax procumbens* leaves was incorporated into the emulsion. The mixture was stirred continuously until a smooth and uniform cream was obtained. Rose oil was added as a fragrance.
- f. Finally, the cream was transferred onto a clean slab, and a few drops of distilled water were added. The cream was then triturated gently to improve its texture and ensure uniform mixing of all ingredients, resulting in a smooth and stable herbal cream.

FORMULATION OF THE HERBAL CREAM

Ingredients Used:-

Sr.No	Content	Composition		
		F1 (100gm)	F2 (50gm)	F3 (20gm)
1	Muntingia Calabura Leaves Extract	4 gm	3gm	1.2gm
2	Tridax Procumbens Leaves Extract	6gm	2gm	0.8gm
3	Bees wax	8gm	4gm	1.6gm
4	Borax	3gm	1.5gm	0.3gm
5	Methyl paraben	0.4gm	0.2gm	0.04gm
6	Liquid paraffin	12gm	6gm	1.2gm
7	Rose oil	4ml	2ml	0.4ml
8	Distilled water	Q.S	Q.S	Q.S
	Total	100gm	50gm	20gm

EVALUATION OF THE CREAM

- i. Evaluation Parameters of Herbal Cream Containing Tridax procumbens and Muntingia calabura Extracts
- ii. Various quality control tests—including physicochemical analysis, visual inspection, and conditioning performance evaluation—were conducted to determine the quality of the formulated product.

1) Physical Evaluation⁽⁵⁸⁾

Parameters	Method	Observation
Colour	Visual inspection in daylight.	light green / off-white.
Odour	Smell the cream gently.	pleasant odour

2) Homogeneity

Take an appropriate amount of the cream and place it on a clean glass slide or the dorsal (back) surface of your hand.

- Observe the cream under normal light for its color, appearance, and the presence of any aggregates, lumps, or visible water/oil droplets.
- A homogeneous cream should have a uniform color and a smooth, consistent appearance.



Fig 5 Homogeneity

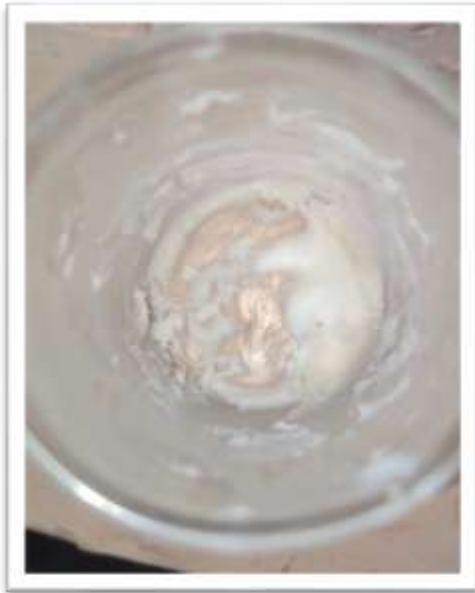
3) Irritancy⁽⁵⁹⁾

Method	Observation	Inference
Apply cream on small area of skin	Check for redness, itching, swelling	Check for redness, itching, swelling

4) Stability Test⁽⁶⁰⁾

Procedure:- Store cream at room temperature and accelerated condition
 Observe for 7–14 days.

Phase separation	Colour Change	Odour Change
	NO	NO



BEFORE THE
STABILITY



AFTER THE
STABILITY

5) Washability

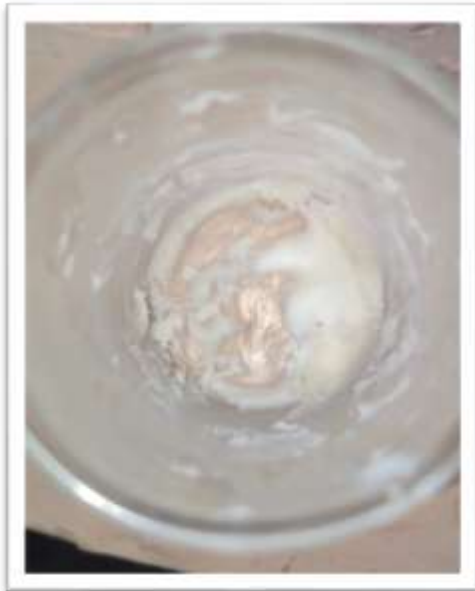
Method: Apply cream on hand and wash with water.

Inference: Should be easily washable without excessive effort.

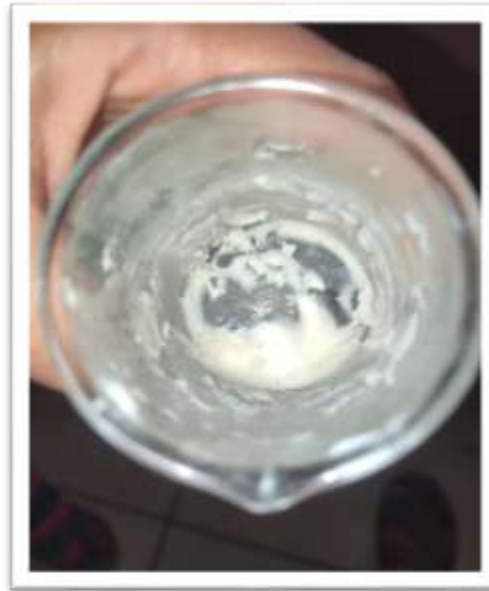
6). Microbial Growth Test⁽⁶¹⁾

Method: Visual inspection over time

Inference: No fungal or bacterial growth due to methyl paraben.



BEFORE THE
MICROBIAL GROWTH



AFTER THE
MICROBIAL
GROWTH

RESULT⁽⁶²⁾

- The formulated herbal cream was successfully prepared and evaluated using various quality control parameters. The results are summarized as follows:
- Physical Appearance: The cream showed a light green to off-white color with a pleasant odor.
- Homogeneity: The formulation was smooth, uniform, and free from lumps or phase separation.
- Irritancy Test: No redness, itching, or swelling was observed, indicating that the cream is non-irritant and safe for skin application.
- Stability Study: The cream remained stable during storage (7–14 days) at room and accelerated conditions, with no change in color or odor.
- Washability: The formulation was easily washable with water, indicating good user compliance.
- Microbial Test: No microbial or fungal growth was observed, confirming the effectiveness of preservatives used (methyl paraben).
- Overall, the results demonstrate that the formulated herbal cream possesses good stability, safety, and desirable physicochemical properties, making it suitable for cosmetic and therapeutic use.

CONCLUSION⁽⁵³⁾

The present study successfully formulated and evaluated a herbal cream containing leaf extracts of *Tridax procumbens* and *Muntingia calabura*, which are well known for their wound healing and skin-protective properties. The cream was prepared using the oil-in-water emulsion method and showed desirable physicochemical characteristics.

The evaluation results demonstrated that the formulated cream possessed a smooth texture, good homogeneity, and a pleasant odor. It was found to be non-irritant on the skin and exhibited good washability,

making it suitable for topical application. Stability studies confirmed that the formulation remained stable under both normal and accelerated conditions without any significant changes in color, odor, or phase separation. Additionally, the absence of microbial growth indicated the effectiveness of the preservative system used.

Overall, the study indicates that the developed herbal cream is safe, stable, and effective, and can serve as a promising natural alternative to synthetic topical formulations with minimal side effects. Hence, it has potential for further development and application in wound healing and skin care treatments.

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