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FORMULATION AND EVALUATION OF MICROEMULSION BASED WOUND HEALING OINTMENT USING JASMINUM SAMBAC LEAVES EXTRACT AND TERMINALIA CHEBULA EXTRACT

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ABSTRACT

The present study aims to formulate and evaluate a wound healing microemulsion-based ointment using Jasminum sambac leaves and Terminalia chebula fruits, both known for their traditional medicinal applications. The plant materials were collected, authenticated, shade-dried, and extracted to obtain phytoconstituent-rich extracts with proven antimicrobial, antioxidant, and anti-inflammatory properties. Jasminum sambac leaves extract and Terminalia chebula extract was prepared by using Soxhlet extraction. microemulsion system was developed using suitable oils, surfactants, and co-surfactants to enhance the solubility, penetration, and therapeutic activity of the combined herbal extracts. The microemulsion was further incorporated into an ointment base and evaluated for physicochemical parameters such as appearance, pH, viscosity, spreadability, and stability. The results indicated that the formulated microemulsion-based ointment exhibited acceptable physicochemical characteristics, good stability, and uniform drug distribution. The formulation demonstrated significant antimicrobial activity and enhanced wound healing potential compared to conventional formulations. The synergistic action of Jasminum sambac and Terminalia chebula extracts, along with the advantages of the microemulsion delivery system, contributed to improved therapeutic efficacy and demonstrated that the combined extract microemulsion-based ointment exhibited good stability, enhanced skin permeation, strong antimicrobial effects, and significant wound healing activity compared to conventional

formulations. Overall, the synergy of Jasminum sambac and Terminalia chebula in a microemulsion system shows promise as a natural and effective wound healing formulation.

KEYWORDS: Jasminum sambac leaves extract, Terminalia chebula extract, Microemulsion ointment, Wound healing Activity.

1. INTRODUCTION

Herbal medicines have gained enormous attention in recent years due to their natural origin, minimal side effecta, and rich content of healing compounds. Plants such as Jasminium sambac and Terminalia chebula are widely celebrated in traditional medicine for their ability to promote wound healing. Jasminium sambac leaves contain flavonoids, saponins, and essential oils that exhibit anti-inflammatory, antimicrobial, and antioxidant effects. Terminalia chebula, often called the "King of Medicines," is rich in tannins, phenolics, and powerful antioxidants that support collagen formation, prevent infection, and accelerate tissue regeneration. Incorporating these herbal extracts into a microemulsion-based ointment blends traditional healing wisdom with modern scientific innovation, resulting in a more effective and skin-friendly wound care formulation.

1.2. Skin

- Skin is the largest organ of the human body.
- It acts as a protective barrier between the internal environment and external world [1].

Skin has three main layers

1. Epidermis (outer layer).
2. Dermis (middle supportive layer).
3. Hypodermis / Subcutaneous layer (deepest fat layer).

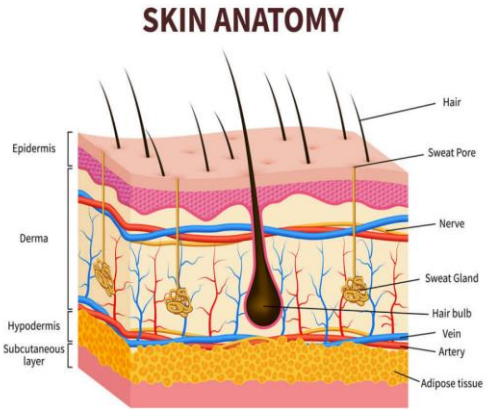

Figure 1: Structure of Skin.

1.3. Ointment

An ointment is a semisolid preparation meant for application on the skin or mucous membranes. It is usually greasy or oily and forms a protective, occlusive layer when applied. Ointments are among the oldest and most commonly used topical preparations in wound care. Their semi-solid nature helps form a protective layer over the wound, prevents contamination, and maintains a moist environment that is ideal for tissue repair. Ointments also act as carriers for therapeutic ingredients such as herbal extracts, antiseptics, antibiotics, and anti-inflammatory agents.[2]

1.4. Microemulsion

Microemulsions are transparent, thermodynamically stable mixtures of oil, water, surfactant, and co-surfactant. Their tiny droplet size usually less than 100 nanometers allow them to easily penetrate through the skin's layers. Microemulsions are also known for their ability to improve the solubility and stability of both hydrophilic and lipophilic compounds. Because many herbal extracts contain bioactive molecules that are poorly soluble or unstable, microemulsions offer a powerful platform to enhance their therapeutic potential.[3]

1.5. Microemulsion based ointment

When microemulsions are incorporated into an ointment base, they give rise to microemulsion-based ointments, which combine the benefits of both systems. These ointments spread smoothly, enhance skin penetration, and allow the active ingredients to be released in a controlled and efficient manner. For wound healing, this combination can significantly accelerate tissue repair, reduce inflammation, and improve overall outcomes compared to traditional ointments.

1.6. Wound

A wound can be described as any break, cut, or abnormal opening in the skin's continuity. Wounds may be accidental such as abrasions, burns, and lacerations or may occur intentionally during surgical procedures.[4]

1.7. Wound Healing

Wound healing is an incredibly complex and beautifully coordinated biological process. It is the body's natural response to injury and involves several types of cells, enzymes, growth factors, and immune components working together. The healing process is typically divided into four overlapping phases: haemostasis, inflammation, proliferation, and remodeling.[5]

2. AIM AND OBJECTIVE

2.1. Aim

To formulate and evaluate a microemulsion-based herbal wound healing ointment using Jasminium sambac and Terminalia chebula extracts for enhanced healing activity.

2.2. Objectives

1. To prepare the herbal extracts of Jasminium sambac leaves and Terminalia chebula fruits using suitable extraction methods.
2. To develop a stable microemulsion formulation using appropriate oil, surfactant, and co-surfactant systems.
3. To incorporate the optimized microemulsion into an ointment base suitable for topical application.
4. To evaluate the physicochemical properties of the formulated ointment (pH, viscosity, spreadability, stability, etc.).

4. PLANT PROFILE

4.1. JASMINUM SAMBAC

Figure 2: Jasminum sambac.

Jasminum sambac is one of those plants that people recognize instantly either by its soothing fragrance or by the memories it carries. Whether it's woven into garlands, infused into hair oils, or used in herbal remedies, this plant has been a gentle presence in many cultures. But behind its delicate appearance lies a plant filled with powerful medicinal properties. Every part-leaf, flower, root, stem, and oil play its own role in healing and wellness.[6]

4.1.1. Botanical Overview

Scientific Name: Jasminum sambac

Family: Oleaceae

Common Names: Arabian Jasmine, Mogra, Gundu Malli, Mallika

Parts Used: Leaves, flowers, roots, stem

Jasminum sambac grows gracefully as a medium-sized shrub. It prefers warm, humid environments and is widely cultivated across India, Southeast Asia, and tropical regions.

4.1.3. Phytochemical Constituents

Different parts contain different sets of compounds.

- Flavonoids
- Terpenoids (linalool, indole, benzyl acetate)
- Phenolic compounds
- Glycosides
- Tannins
- Essential oils

These constituents explain the plant's healing, calming, and protective effects.

4.1.4. Pharmacological Activities

Research supports several activities

- **Wound healing Activity:** Promotes faster wound contraction and epithelization.
- **Antimicrobial Activity:** Effective against certain bacteria and fungi.
- **Anti-inflammatory Activity:** Reduces inflammation by inhibiting inflammatory mediators like prostaglandins.
- **Antioxidant Activity:** Removes free radicals and reduces oxidative stress.
- **Skin-protective Activity:** Protects the skin from damage and maintains healthy skin function.
- **Astringent property:** Cause contraction or tightening of tissue, reduce secretions and helps in wound healing.

4.2. TERMINALIA CHEBULA

Figure 3: Terminalia chebula.

1. Botanical Classification

Kingdom: Plantae

Division: Magnoliophyt

Class: Magnoliopsida

Order: Myrtales

Family: Combretaceae

Genus: Terminalia

Species: Terminalia chebula Retz.

5. Phytochemical Constituents

The fruits of T. chebula are rich in bioactive compounds such as.

- Tannins (30–45%) — chebulagic acid, chebulinic acid, corilagin
- Gallic acid & ellagic acid
- Flavonoids
- Phenolic compounds
- Terpenoids
- Amino acids
- Glycosides
- Fixed oils[7]

7. Pharmacological Activities

Modern scientific studies report the following activities.

- **Antimicrobial Activity:** Useful in infections of oral cavity, GIT, skin.
- **Anti-inflammatory Activity:** Helps in arthritis, ulcers, inflammatory disorders.
- **Antioxidant Activity:** Neutralise free radicals and reduces oxidative stress.
- **Wound Healing Activity:** Promotes collagen formation and Accelerates tissue pair.
- **Analgesic Activity:** Reduces pain by suppressing inflammatory pathways.
- **Antidiabetic Activity:** Helps reduce blood glucose levels and Improves insulin sensitivity.
- **Hepatoprotective Activity:** Protects liver cells from toxins.[8]

5. MATERIALS AND METHOD

5.1. EXTRACTION BY SOXHLET APPARATUS

Place the powdered plant material in a thimble and position it in the Soxhlet extractor. Fill the round-bottom flask with an appropriate solvent (e.g., ethanol). Heat the solvent in the flask, allowing it to vaporize and condense over the plant material in the thimble. The solvent with repeatedly wash the material and extract the bioactive compounds. Continue the process for

6-8 hours. This ensures the extraction. After completion, remove the plant material, and filter the extract to remove any remaining solid particles.[9]

Figure 4: Soxhlet Extraction.

5.2. FORMULATION OF OINTMENT(20 gm)

MICROEMULSION

INGREDIENTS	F1
Isopropyl myristate	1.7ml
Tween 80	1.1ml
Propylene glycol	0.8ml
Jasminum extract	1.1ml
Terminalia chebula	1.1ml
Distilled water	0.8ml

OINTMENT BASE

INGREDIENTS	F1
White soft paraffin	7gm
Bees wax	1gm
Liquid paraffin	3.5ml
Propylene glycol	0.9ml
Methyl paraben	0.2gm
Distilled water	0.8ml

5.3. PREPARATION OF MICROEMULSION

PROCEDURE

1. Accurately weigh surfactant (tween 80) and co-surfactant (propylene glycol)- Smix.
2. Mix thoroughly using a magnetic stirrer at 300-500 rpm until uniform.
3. Slight heating (30-40^{o}c) can help reduce viscosity.
4. Measure the required quantity of selected oil (Isopropyl myristate).

5. Lipophilic drug extracts like Jasminum sambac, Terminalia chebula are dissolved in the oil phase.
6. Slowly add the oil phase to the Smix, continuously stirring.
7. Continue stirring until a clear, homogenous mixture is obtained.
8. Now add aqueous phase dropwise with continuous stirring.[10]

5.4. PREPARATION OF OINTMENT

PROCEDURE

1. Melt white soft paraffin, liquid paraffin, bees wax.
2. Heat gently in a water bath at 70^{o}c until all solids melt completely.
3. Warm methylparaben in a small amount of propylene glycol and water and mix into a base to ensure preservation.
4. Combine oil phase and preservative phase at 70^{o}c with stirring to form semi-solid base.
5. At 40^{o}c add microemulsion pre-concentrate slowly with continuous and moderate stirring to form uniform product.
6. The ointment was stirred well, packed and stored in a closed container.
7. Allow it to cool and solidify completely.[11]

6. PHYTOCHEMICAL TEST

PHYTOCONSTITUENTS	TEST PERFORMED	OBSERVATION
Flavonoids	Alkaline reagent test	Yellow colour formed
Alkaloids	Mayer's and Wagner's test	Brown colour formed
Glycosides	Keller-kiliani test	Deep blue colour in acidic layer
Triterpenoids	Salkowski test	Golden brown colour formed
Saponin	Foam test	Persistent froth
Phenols and tannins	Ferric chloride test and Lead acetate test	Greenish White precipitate [12]

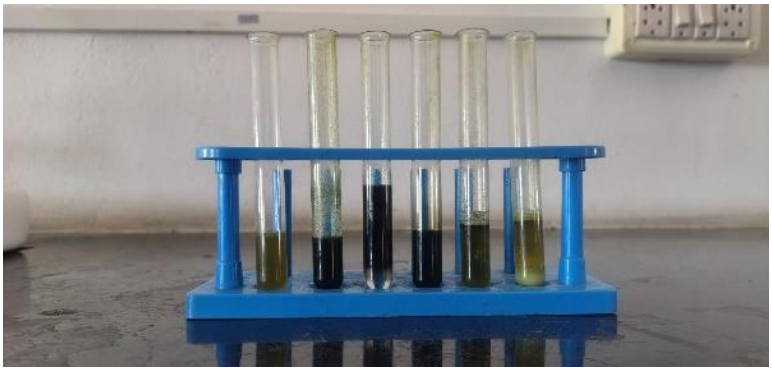

Figure 5: Phytochemical tests.

8.1. PHYTOCHEMICAL SCREENING

S.NO	SECONDARY METABOLITES	RESULTS (PRESENCE/ ABSENCE)
1.	Flavonoids	+
2.	Alkaloids	+
3.	Glycosides	+
4.	Triterpenoids	+
5.	Saponins	+
6.	Phenols and tannins	+

8.2. PHYSICAL PARAMETERS

S.NO	PARAMETERS	FORMULATION RESULT
1.	Colour	Olive yellow
2.	Odour	Pleasant
3.	Homogeneity	Smooth & Homogeneous
4.	Emolliency	Smooth & Hydrate skin
5.	Spreadability	Good & Evenly spread
6.	Washability	Easy to wash
7.	Consistency	Good & consistent
8.	Texture	Smooth
9.	Stability	Stable
10.	Appearance	Creamy texture[13]

8.3. CHEMICAL PARAMETERS

S.NO	PARAMETERS	FORMULATION RESULT
1.	Photosensitivity	Safe to use
2.	P^H	6.12
3.	Loss on Drying	2.6% w/w

Figure 6: pH Measurement.

8.4. MICROBIOLOGICAL EVALUATION

S.NO	PARAMETER	FORMULATION RESULT
1.	Anti- microbial test	Good Anti-microbial Activity

9. CONCLUSION

The present study successfully developed and evaluated a wound healing microemulsion-based ointment containing Jasminum sambac leaf extract and Terminalia chebula fruit extract. Both plant extracts are rich in flavonoids, tannins, phenolics, glycosides, alkaloids and other bioactive constituents, were effectively incorporated into a stable and transparent microemulsion system that enhanced their solubility and skin penetration. The formulated ointment showed ideal physicochemical properties, including acceptable pH, good spreadability, uniform consistency, and excellent stability under different storage conditions. The overall wound healing assessment indicated faster wound contraction, reduced epithelialization time, and enhanced tissue regeneration compared to conventional formulations. These findings suggest that the synergistic combination of Jasminum sambac and Terminalia chebula in a microemulsion base can serve as a promising, natural, and effective topical agent for wound healing applications. Further clinical studies may help validate its therapeutic potential for broader use.

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