
FORMULATION AND EVALUATION ON ANTI RASH PASTE

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DOI: <https://doi-doi.org/101555/ijarp.2396>**ABSTRACT**

Skin rashes are one of the most common dermatological conditions caused by irritation, infection, allergies, or prolonged exposure to moisture and friction. These conditions often lead to discomfort, redness, inflammation, and itching, affecting individuals of all age groups, especially infants and people with sensitive skin.

The present study focuses on the formulation and evaluation of a topical anti-rash paste designed to provide relief from skin irritation and promote healing. The formulation incorporates natural and pharmaceutical ingredients known for their soothing, antiinflammatory, antimicrobial, and protective properties.

The anti-rash paste was prepared using ingredients such as zinc oxide, calamine, aloe vera extract, and other excipients that enhance stability and spreadability. The preparation method was carefully designed to ensure uniform consistency and effectiveness.

Evaluation parameters such as pH, viscosity, spreadability, stability, and skin irritation tests were conducted to determine the quality and safety of the formulation. The results indicated that the prepared paste exhibited suitable physicochemical properties and was effective in reducing irritation without causing adverse effects.

This project highlights the importance of topical formulations in dermatological care and demonstrates the potential of combining traditional and modern pharmaceutical approaches to develop safe and effective skincare products.

INTRODUCTION:

TOPICAL DRUG DELIVERY SYSTEM:

Topical drug administration is a localized drug delivery system anywhere in the body through ophthalmic, rectal, vaginal and skin as topical routes. Skin is one of the most readily accessible organs on human body for topical administration and is main route of topical drug delivery system.

PHYSIOLOGY OF SKIN :-

The skin has many layers. The overlaying outer layer is called epidermis, the layer below epidermis is called dermis. They dermis contain a network of blood vessels, hair follicle, sweat gland and sebaceous gland. Beneath the dermis are subcutaneous fatty tissues. Bulbs of hair project in to these fatty tissues.

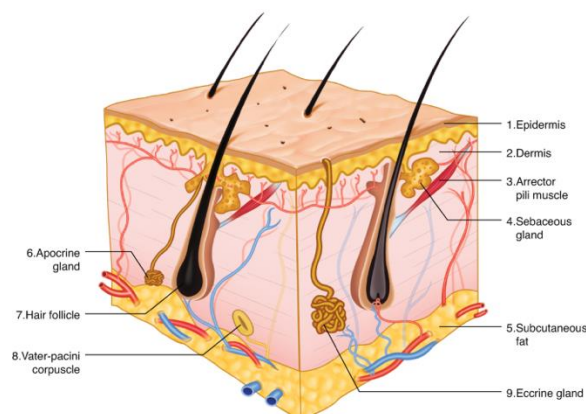


Fig no.02 Physiology of Skin.

1) Epidermis:

It is the uppermost multi-layer of the skin, composed of stratified keratinised squamous epithelium. It contains four principal types of cells, such as keratinocytes (90%), melanocytes, langerhans cells and merkel cells. The thickness of epidermis varies depending on the cell size

and the number of cell layers ranging from about 0.8 mm on the palms and soles down to 0.6 mm on the eyelids. The epidermis is divided into 5 sub-layers namely:

- (a) Stratum corneum (horny layer)
- (b) Stratum lucidum
- (c) Stratum granulosum (granular layer)
- (d) Stratum spinosum (prickly cell layer)

stratum germinativum (basal layer and dermoepidermal junction)

2) Dermis:-

Dermis is the second deeper region lying in between the epidermis and subcutaneous fatty region. It is formed from connective tissues containing collagen and elastin fibre including few cells as fibroblasts, macrophages and adipocytes. Blood vessels, nerve glands and hair follicles are embedded in dermal tissues. The superficial portion of dermis called papillary layer which consists of areolar connective tissues containing fine elastin fibres. The surface area is greatly increased by small finger like projection called dermal papillae which contains papillary loops project into the epidermis. These dermal papillae contain tactile receptors called corpuscles of touch or meissner corpuscles, nerve endings that are sensitive to touch. The reticular region, attached to the subcutaneous layer consists of dense irregular connective tissues containing fibroblast, bundles of collagen and some coarse elastic fibres. These collagen and elastin fibres provide strength, extensibility and elasticity to the skin. The extensibility can be seen during pregnancy and obesity which sometimes leave striae (stretch marks) on the skin surface.

1. Hypodermis (hypo = below):

It is a subcutaneous layer which lies deep to the dermis, but not the part of skin. This layer consists of areolar and adipose tissues known as superficial fascia attaching the dermis to the underlying structures. This region also contains nerve endings called lamellate (pacinian) corpuscles that are sensitive to pressure. It serves as the storage depot for fat and contains large blood vessels that supply the skin.

2. Skin appendages:

These are also known as skin derivatives which include hair follicles, associated sebaceous glands (pilosebaceous glands), sweat glands (eccrine and apocrine glands) and nails.

I) Hair follicle: it is the product of synthesized protein following cell division at the root of hair

pressure. The number of hairs per unit area varies at different parts of the body.

II) Sebaceous glands: these are responsible for sebum secretion and constitute fatty layer over the skin and hair. These are present on face, shoulders, upper chest and scalp but not palms and soles. The abundance of sebaceous glands is 500-1000 per square centimetre.

III) Eccrine sweat glands: these are salty sweat glands distributed over the surface of the body in order to regulate the body temperature by secreting dilute aqueous solution of

salt and some other minor components called salt. These glands are simple coiled tubes with density from 100-200 glands per centimetre square of the body surface depending on the region.

IV)Apocrine glands: these are present only on the selected region of the body such as axillae (armpits) in anogenital region and around the nipples. Due to emotional stress and sexual stimulation, they secrete milky substance containing protein, lipoprotein, lipids and diverse proteins. These are ten folds larger than the eccrine sweat gland.

V) Nails: nails are plates of tightly packed, hard, dead, keratinized epidermal cells that form a clear, solid covering over dorsal surface of distal portion of digits

FUNCTIONS OF SKIN

The skin performs a multitude of functions listed below:

1. It forms the protective waterproof layer which acts as barrier against injury and microbial invasion, chemical agents and various environmental agents.
- 2.It contributes to thermoregulation by liberating sweat, on the surface and by adjusting the flow of blood in the dermis.
- 3.It also serves as blood reservoir where dermis houses and extensive network of blood vessels that carry 8-10 % of total blood in a resting adult.
- 4.It serves as the medium of sensation, including tactile sensation touch, pressure, vibration and tickling as well as thermal sensation such as warmth and coolness and also the sensation of pain.
- 5.It excretes sodium chloride and metabolites like urea.
- 6.It also helps in maintaining water and electrolyte balance.
- 7.It helps in synthesis of vitamin d from ergosterol of skin by the action of uv rays of Sunlight.
- 8.It synthesizes melanin from tyrosine.
9. It secretes sweat and sebum which keep the skin soft.
10. It stores fat, water, chlorides and sugar

1.1 Overview of Skin and Rashes

The skin is the largest organ of the human body and acts as a protective barrier against environmental factors such as microbes, chemicals, and physical damage. However, due to various internal and external factors, the skin may develop rashes.

A rash is defined as a noticeable change in the texture or color of the skin. It may be accompanied by itching, redness, swelling, or pain.

Background of the Study

The skin is the outermost covering of the human body and serves as a protective barrier against environmental hazards such as microorganisms, chemicals, ultraviolet radiation, and physical injuries. It plays a crucial role in regulating body temperature, preventing water loss, and providing sensory perception.

Despite its protective nature, the skin is highly susceptible to various disorders, among which **skin rashes** are one of the most common conditions. Skin rashes can affect individuals of all ages, from infants (diaper rash) to adults (contact dermatitis, heat rash, allergic reactions).

A skin rash is defined as a noticeable change in the color, texture, or appearance of the skin. It may present as redness, swelling, itching, dryness, or blister formation. While some rashes are mild and temporary, others can lead to severe discomfort and complications if not treated properly.

Due to increasing environmental pollution, changing lifestyles, and the widespread use of synthetic products, the incidence of skin-related issues has significantly increased. This highlights the need for safe, effective, and affordable topical treatments.

1.2 Definition of Anti-Rash Paste

An **anti-rash paste** is a semi-solid topical formulation designed to be applied externally on the skin to prevent or treat rashes, irritation, and inflammation.

It typically contains:

- Protective agents (e.g., zinc oxide)
- Soothing agents (e.g., calamine)
- Moisturizers (e.g., glycerin, aloe vera)
- Absorbents (e.g., kaolin)
- Preservatives

Unlike creams or ointments, pastes are thicker and remain longer on the skin, forming a protective layer that shields the affected area from moisture and irritants.

1.3 Classification of Skin Rashes

Skin rashes can be broadly classified based on their causes:

1.3.1 Contact Dermatitis

Occurs when the skin comes in contact with irritants or allergens such as soaps, detergents, or chemicals.

1.3.2 Heat Rash (Miliaria)

Caused by blockage of sweat glands due to excessive sweating, commonly seen in hot and humid climates.

1.3.3 Diaper Rash

Common in infants due to prolonged exposure to moisture, urine, and friction.

1.3.4 Allergic Rash

Triggered by allergens such as food, pollen, or medications.

1.3.5 Infectious Rash

Caused by bacterial, fungal, or viral infections.

1.4 Causes of Skin Rashes

Skin rashes can be caused by multiple factors, including:

Allergic Reactions

This is one of the most common causes. The immune system overreacts to a substance that is otherwise harmless

Types:

- **Contact dermatitis** – occurs when skin touches allergens like soaps, perfumes, metals (nickel), detergents, or plants.
- **Urticaria (hives)** – raised, itchy red patches caused by foods, drugs, or environmental triggers

-Infections (Bacterial, Viral, Fungal)

Microorganisms can infect the skin directly or cause rashes as part of systemic illness.

Types:

- **Bacterial:** impetigo, cellulitis
- **Viral:** measles, chickenpox, dengue rash
- **Fungal:** ringworm (tinea), candidiasis

Examples:

- Chickenpox causes itchy blisters

- Ringworm causes circular, scaly patches

Heat and Sweat (Environmental Causes)

Very common in hot and humid climates (like India).

Condition:

- **Miliaria (heat rash)** – sweat ducts get blocked, causing red bumps.

Triggers:

- Hot weather
- Tight clothing
- Excess sweating

Key features:

- Small red bumps
- Prickly or burning sensation
- Common on neck, back, chest



Understanding these causes is essential for developing an effective anti-rash formulation.

1.5 Symptoms of Skin Rashes

Common symptoms associated with skin rashes include:

- Redness (erythema)
- Itching (pruritus)
- Swelling (inflammation)
- Dryness or scaling
- Burning sensation
- Blisters or lesions

These symptoms may vary depending on the severity and type of rash.

1.6 Need for Topical Anti-Rash Formulations

Topical formulations are preferred for treating skin conditions because they offer several advantages:

- **Localized Action:** Direct application on affected area
- **Reduced Side Effects:** Minimal systemic absorption
- **Ease of Application:** Simple and convenient
- **Rapid Relief:** Faster action compared to oral medications
- **Protection:** Forms a barrier against irritants

Anti-rash pastes, in particular, are beneficial because they remain in place and provide prolonged protection.

1.7 Advantages of Anti-Rash Paste

Creates a strong physical barrier: It seals out moisture, friction, urine, and faeces, allowing the skin beneath to heal.

Accelerates wound healing: The zinc oxide found in popular options like Boudreaux's Butt Paste actively repairs damaged skin cells and tissue.

Reduces skin inflammation: It provides instant cooling and soothing relief to red, burning, or severely irritated skin.

Stays in place: Unlike thin lotions or creams, the thick paste consistency ensures the product remains on the affected area for extended protection.

Controls excess oil: Zinc oxide acts as a mild astringent, helping to maintain oil balance on the skin surface

1.8 Disadvantages of Anti-Rash Paste

Difficult to clean: Pastes do not absorb fully into the skin and are notoriously hard to wash off with standard water.

Stains fabrics easily: The thick, white residue easily transfers to clothing, diapers, and bedding, leaving difficult-to-remove stains.

Messy application: It features a sticky, greasy texture that leaves residue on your fingers during application.

Risk of localized allergies: Certain inactive ingredients, preservatives, or fragrances can trigger hives, itching, or worsening rashes in sensitive individuals.

Traps bacteria if misused: Applying the heavy paste over unwashed or damp skin can lock in bacteria or moisture, which worsens the infection.

1.9 Role of Ingredients in Anti-Rash Paste

Each ingredient in the formulation plays a specific role:

- **Zinc Oxide:** Protects skin and reduces inflammation
- **Calamine:** Provides soothing and anti-itch effect
- **Aloe Vera:** Promotes healing and hydration
- **Kaolin:** Absorbs moisture and toxins
- **Glycerin:** Maintains skin hydration
- **Preservatives:** Prevent microbial contamination

The proper combination of these ingredients ensures effectiveness and safety.

1.10 Ideal Properties of Anti-Rash Paste

An ideal anti-rash paste should have the following characteristics:

- Smooth and uniform consistency
- Non-irritating and safe
- Good spreadability
- Stable under different conditions
- Effective in reducing irritation and inflammation

1.11 Scope of the Study

The present study focuses on the formulation and evaluation of a topical anti-rash paste using suitable pharmaceutical ingredients.

The scope includes:

- Selection of appropriate ingredients
- Preparation of paste using standard methods
- Evaluation of physicochemical properties
- Testing for safety and effectiveness

1.12 Objectives of the Study

Primary Objective

To formulate and evaluate a safe and effective topical anti-rash paste.

Secondary Objectives

- To study the properties of ingredients used
- To develop a stable formulation
- To evaluate parameters such as pH, viscosity, and spreadability
- To assess skin compatibility

1.2 Causes of Skin Rashes

- Allergic reactions

Heat and sweating

Friction (diaper rash, chafing)

Microbial infections

- Chemical irritants

1.3 Need for Anti-Rash Paste

Topical anti-rash formulations are essential because they:

- Provide localized treatment
- Reduce inflammation and redness
- Protect the skin barrier
- Prevent infection
- Promote healing

1.4 About Anti-Rash Paste

Anti-rash paste is a semi-solid topical preparation applied externally to protect the skin and relieve irritation. It typically contains:

- Protective agents (e.g., zinc oxide)

- Soothing agents (e.g., aloe vera)
- Antimicrobial agents
- Moisturizing bases

2.1 Scope

A literature review is a critical summary of previous research work related to the formulation and evaluation of topical anti-rash preparations. It provides a scientific foundation for the present study and helps in selecting appropriate ingredients, methods, and evaluation parameters.

Topical formulations have been widely used in dermatology for treating various skin conditions, including rashes, inflammation, infections, and irritation. Over the years, both synthetic and natural ingredients have been explored for their therapeutic effectiveness.

2.2 Overview of Topical Drug Delivery Systems

Topical drug delivery systems are formulations applied directly to the skin to achieve a localized therapeutic effect. These systems include:

- Ointments

Creams

Gels

Lotions

- Pastes

Among these, **pastes** are particularly useful for treating rashes due to their thick consistency and protective nature.

Advantages of Topical Delivery

- Avoids first-pass metabolism
- Reduces systemic side effects
- Provides targeted action
- Improves patient compliance

2.3 Review of Anti-Rash Formulations

Several studies have been conducted on anti-rash formulations using both pharmaceutical and herbal ingredients.

Study 1: Zinc Oxide-Based Formulations

Zinc oxide has been widely used as a skin protectant. Research indicates that it:

- Forms a physical barrier on the skin
- Reduces inflammation
- Protects against moisture

It is commonly used in diaper rash creams and dermatological pastes.

Study 2: Calamine in Skin Care

Calamine is known for its soothing and anti-itch properties. Studies show that it:

- Provides cooling effect
- Relieves itching and irritation
- Is safe for sensitive skin

Study 3: Aloe Vera in Dermatology

Aloe vera has been extensively studied for its medicinal properties. It contains bioactive compounds that:

Promote wound healing

Reduce inflammation

Provide hydration

Study 4: Herbal Anti-Rash Preparations

Recent trends focus on herbal formulations due to fewer side effects. Ingredients like neem, turmeric, and aloe vera are commonly used.

These formulations are:

- Biocompatible
- Less irritating
- Environment-friendly

2.4 Role of Excipients in Topical Formulations

Excipients are inactive ingredients that play a crucial role in the formulation.

Kaolin

- Acts as an absorbent
- Removes excess moisture
- Provides smooth texture

Glycerin

- Works as a humectant
- Retains moisture in skin
- Prevents dryness

Preservatives (e.g., Methyl Paraben)

- Prevent microbial growth
- Increase shelf life

2.5 Evaluation Parameters in Previous Studies

Various evaluation tests have been used in earlier research to assess topical formulations:

1. pH Measurement

Ensures compatibility with skin

Ideal range: 5.5–7

2. Viscosity

- Determines thickness and flow properties

3. Spreadability

- Indicates ease of application

4. Stability Studies

- Evaluates formulation under different conditions

5. Skin Irritation Test

- Ensures safety for human use

2.6 Challenges in Anti-Rash Formulation

Despite advancements, some challenges remain:

- Achieving optimal consistency
- Preventing microbial contamination
- Maintaining stability
- Avoiding skin irritation

Proper formulation strategies are required to overcome these challenges.

2.7 Recent Advances in Topical Formulations

Modern research focuses on:

- Nano-formulations

- Herbal-based products
- Improved drug delivery systems
- Long-lasting formulations

These advancements aim to enhance effectiveness and patient satisfaction.

2.8 Summary of Literature Review

The literature suggests that:

- Zinc oxide and calamine are effective anti-rash agents
- Aloe vera enhances healing and hydration
- Pastes are suitable for protective action
- Evaluation parameters are essential for quality control

MATERIALS AND METHODS

3.1 Materials Required

Ingredient Table

Sr. No.	Ingredient	Quantity	Role
1	Zinc Oxide	10 g	Skin protectant
2	Calamine	5 g	Soothing agent
3	Aloe Vera Gel	15 g	Moisturizer & healing
4	Glycerin	5 ml	Humectant
5	Kaolin	10 g	Absorbent
6	Distilled Water	q.s.	Base
7	Methyl Paraben	0.2 g	Preservative

2.2 Ingredient Details

Zinc Oxide

- White powder
- Anti-inflammatory and protective
- Forms barrier on skin

Calamine

- Pink powder
- Reduces itching and irritation



Aloe Vera

- Natural extract
- Cooling and healing properties



Kaolin

Clay mineral

- Absorbs moisture and toxins

METHOD OF PREPARATION

Step-by-Step Procedure

1. Weigh all ingredients accurately.
2. Take zinc oxide and calamine in a mortar.
3. Triturate the powders to obtain a fine mixture.
4. Add kaolin and mix thoroughly.

5. Slowly add glycerin and triturate to form a smooth paste.
6. Add aloe vera gel gradually with continuous mixing.
7. Add distilled water dropwise to adjust consistency.
8. Finally, add preservative and mix uniformly.
9. Transfer the paste into a clean container.

Flowchart of Preparation

Mixing Powders → Adding Liquid → Homogenization → Final Paste (*Insert flowchart image*)

EVALUATION OF ANTI-RASH PASTE

4.1 Introduction

Evaluation of the formulated anti-rash paste is essential to ensure its **quality, safety, stability, and effectiveness**. Various physicochemical and biological parameters are tested to confirm that the formulation is suitable for topical application.

These tests help determine whether the paste meets standard requirements for dermatological use.

4.2 Evaluation Parameters

The prepared anti-rash paste was evaluated using the following parameters:

4.3 Physical Appearance

Objective:

To examine the visual characteristics of the formulation.

Parameters Observed:

- Color
- Odor
- Texture
- Consistency **Procedure:**

A small quantity of paste was visually inspected.

Observation:

Parameter	Observation
Color	Light pink/white
Odor	Mild
Texture	Smooth
Consistency	Semi-solid

4.4 pH Determination

Objective:

To ensure the formulation is compatible with skin pH.

Procedure:

1. Dissolve a small amount of paste in distilled water.
2. Measure pH using a calibrated pH meter.

Result:

- Observed pH: **6.2 Conclusion:**

The pH is within the acceptable skin range (5.5–7), making it safe for topical use.

4.5 Spreadability Test

Objective:

To determine how easily the paste spreads on the skin.

Apparatus:

- Glass slides

Formula: $Weight = \frac{M \times L}{T}$ Where:

- S = Spreadability
- M = Weight applied (g)
- L = Length moved (cm)
- T = Time taken (sec) **Procedure:**

1. Place paste between two slides.
2. Apply weight on the upper slide.
3. Measure time taken for spreading.

4. **Result:**

5. Trial	Time (sec)	Spreadability
1	6	Good
2	5	Good

Conclusion:

The formulation shows good spreadability.

4.6 Viscosity Test

Objective:

To determine the thickness and flow property.

Instrument:

Viscometer

Procedure:

- Measure viscosity at room temperature **Result:**
- Viscosity: Moderate **Conclusion:**

The paste has suitable consistency for application.

4.7 Stability Study

Objective:

To evaluate stability under different conditions.

Conditions:

- Room temperature
- Refrigerated condition
- Elevated temperature **Observation Period:**

15–30 days

Parameters Observed:

- Color change
- Odor • Phase separation
- **Result:**

	Condition	Observation
Room Temp		No change
Refrigerated		Stable
High Temp		Slight dryness

CONCLUSION:

The formulation is stable under normal conditions.

4.8 Skin Irritation Test

Objective:

To check safety on skin.

Procedure:

6. Apply a small amount on skin 7. Observe for 24 hours

8. Observation:

9. Parameter		Result
Redness	Absent	
Itching	Absent	
Irritation	None	

Conclusion: The formulation is safe and non-irritating.

4.9 Washability Test

Objective:

To check ease of removal.

Result:

Easily washable with water

4.10 Extrudability

Objective:

To measure ease of squeezing from tube.

Result:

Smooth extrusion observed

4.11 Summary of Results

10. Test	Result
Physical Appearance	Acceptable
pH	6.2 (Safe)
Spreadability	Good
Viscosity	Suitable
Stability	Stable
Irritation	None

4.12 Discussion

The evaluation results indicate that the formulated anti-rash paste meets all the required standards for topical application. The presence of zinc oxide and calamine provides protection and soothing effect, while aloe vera enhances healing.

The formulation showed:

- Good stability
- Suitable consistency
- No irritation

Thus, it can be considered effective for managing skin rashes.

RESULTS, DISCUSSION, CONCLUSION AND REFERENCES

11.

5.1 Results

12. The anti-rash paste formulated in this study was evaluated using various physicochemical and biological parameters. The results obtained from these tests are summarized below.

5.1.1 Summary of Evaluation Results

13. Sr. No.	Parameter	Result Observed	Remarks
1	Physical Appearance	Smooth, semi-solid	Acceptable
2	Color	Light pink/white	Good
3	Odor	Mild	Pleasant
4	pH	6.2	Skin-friendly
5	Spreadability	Good	Easy to apply
6	Viscosity	Moderate	Suitable
7	Stability	Stable	No major changes
8	Skin Irritation	None	Safe
9	Washability	Easy	

5.2 Discussion

The present study was aimed at the formulation and evaluation of a topical anti-rash paste using suitable pharmaceutical and natural ingredients.

The formulation was successfully prepared using the **trituration method**, ensuring uniform mixing and smooth consistency. Each ingredient played a significant role in enhancing the effectiveness of the formulation:

- **Zinc oxide** acted as a protective barrier and reduced inflammation.
- **Calamine** provided a soothing and anti-itching effect.
- **Aloe vera** contributed to healing and hydration.
- **Kaolin** absorbed excess moisture and improved texture.
- **Glycerin** maintained skin moisture and prevented dryness.

The evaluation results indicated that the formulation possessed all the desired characteristics of an ideal topical paste:

- The **pH (6.2)** was within the acceptable range for skin, ensuring safety.
- The paste showed **good spreadability**, making it easy to apply.
- **Viscosity** was appropriate, ensuring the paste remains on the skin without flowing.
- The **stability study** confirmed that the formulation remained stable under different conditions.
- The **skin irritation test** showed no signs of redness or irritation, indicating good compatibility.

Overall, the formulation demonstrated **effective soothing, protective, and healing properties**, making it suitable for treating skin rashes.

5.3 CONCLUSION

From the present study, it can be concluded that:

- The topical anti-rash paste was successfully formulated using safe and effective ingredients.
- The formulation showed **good physicochemical properties** such as suitable pH, viscosity, and spreadability.
- It was found to be **stable under normal storage conditions**.
- No skin irritation was observed, indicating that the formulation is **safe for topical use**.
- The combination of natural and pharmaceutical ingredients enhanced the overall effectiveness of the product.

Thus, the formulated anti-rash paste can be considered a **promising and effective treatment for skin rashes**, providing protection, राहत (relief), and healing.

5.4 Limitations of the Study

- Study conducted on a small scale
- Limited duration of stability study
- No advanced clinical trials performed

5.5 Future Scope

- Large-scale production
- Clinical testing on different skin types
- Addition of herbal extracts for enhanced effect
- Development of advanced formulations (gel/cream variants)

5.6 REFERENCES

(You can format these in your college-required style – APA / Vancouver etc.)

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