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Review on Formulation and Evaluation of Calamine Lotion

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Abstract: ***Herbal cosmetic formulations are crafted using plantderived ingredients blended with appropriate cosmetic bases to treat and manage a variety of skin-related concerns. As the name suggests, these products originate from natural sources and typically do not contain synthetic additives that could potentially cause skin irritation or adverse reactions. Compared to conventional cosmetic products, herbal alternatives are generally considered gentler and safer for continuous application. The growing field of cosmeceuticalsproducts that merge cosmetic appeal with therapeutic action focuses on enhancing skin health while addressing specific concerns such as acne, premature aging, and protection against UV radiation.***

Calamine lotion is a well-known topical preparation valued for its antiseptic, soothing, and cooling effects, commonly used to alleviate mild skin irritations and discomforts. This study investigates the substitution of synthetic agents in calamine lotion with natural ingredients, specifically focusing on aloe vera gel and honey, which are known for their hydrating properties and function effectively as natural humectants. The aim is to promote skincare through botanical means while preserving the functional benefits of the formulation. In particular, this research seeks to compare the moisturizing capacity of glycerin a widely used semi-synthetic humectant with that of its herbal counterparts, evaluating the potential of formulating calamine lotion entirely with natural moisturizing agents.

Keywords: Humectants, Emollient, Antiseptic, Calamine Lotion

I. INTRODUCTION

Calamine lotion is categorized under shake poultices, a specific type of topical suspension composed of finely dispersed solid particles. Its core therapeutic agents include calamine and zinc oxide, combined with additional excipients such as bentonite, glycerin, sodium citrate, and liquefied phenol [1]. This formulation focuses solely on preparations containing calamine embrocation and does not address products that use calamine or zinc oxide as standalone ingredients. In general, poultices are liquid formulations either solutions or suspensions designed for external application. When applied, the liquid base evaporates, leaving a thin layer of medication on the skin. Shake poultices, which are unstable suspensions of powdered materials, require thorough shaking before each use to ensure consistent distribution of the active ingredients [2]. The United States Food and Drug Administration (USFDA) classifies calamine embrocation as an over-the-counter (OTC) topical skin protectant [3]. Furthermore, the World Health Organization (WHO) recognizes it as an essential medication in topical therapy due to its antiinflammatory and antipruritic (anti-itch) effects [4]. For practical application, shake poultices are commonly packaged in wide-mouthed containers to accommodate brushes similar to cosmetic or applicator brushes used to evenly spread the medication over the affected skin areas [5]. It is important to highlight that the composition of calamine embrocation varies slightly across official pharmacopeias. The British Pharmacopoeia (BP) defines calamine as basic zinc carbonate tinted with ferric oxide, while the United States Pharmacopoeia (USP) describes it as zinc oxide pigmented with ferric oxide. This distinction underscores differences in formulation across regulatory standards [6].

II. TYPES OF LOTIONS

Lotions are formulated to address diverse skin care needs, ranging from maintaining youthful radiance to tackling issues like tanning, wrinkles, and cellulite. Based on their primary functions, body lotions can be broadly categorized as follows:

1) Skin-Nourishing Lotions: These lotions aim to promote overall skin health by keeping it hydrated, soft, and glowing. They are formulated to cater to different skin types—dry, oily, or normal—ensuring an optimal balance of moisture and nourishment [7].
2) Restorative or Repair Lotions: These formulations are intended for severely dry, irritated, or compromised skin. They help soothe discomfort, repair damage, and reinforce the skin's natural barrier function [8].

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3) Cellulite-Reducing Lotions: These lotions are designed to diminish the appearance of cellulite by firming the skin and enhancing its texture. They often contain caffeine or other active agents to improve circulation and skin tone in affected areas [9].
4) Anti-Ageing or Wrinkle-Reduction Lotions: Targeting mature or prematurely aged skin, these lotions incorporate ingredients like retinol, peptides, and antioxidants to reduce fine lines and improve elasticity [10].
5) Brightening and Anti-Tan Lotions: Used to diminish tanning effects and promote a brighter complexion, these lotions often contain ingredients that inhibit melanin synthesis, such as niacinamide, licorice extract, or kojic acid [11].
6) Stretch Mark Lotions: Commonly used by pregnant individuals and those experiencing rapid weight changes, these lotions help in both the prevention and reduction of stretch marks. Ingredients like cocoa butter, shea butter, and centella asiatica extract are often employed for their skinregenerative properties [12].

III. BENEFITS OF CALAMINE LOTION

1) Calamine lotion is effective in managing acne by reducing inflammation and absorbing excess oil from the skin[13].
2) It aids in drying out fluid from minor skin issues such as chickenpox blisters, insect stings, measles rashes, eczema flare-ups, sunburns, and contact with plants like poison ivy[14].
3) Owing to its soothing and cooling nature, calamine is commonly applied as a protective and mildly antiseptic agent in various dermatological conditions[15].
4) When used on the breast area, calamine lotion may create minor opacities on mammograms that resemble microcalcifications[16].
5) It helps alleviate the symptoms associated with skin lesions, providing relief through its calming action[17].
6) Calamine is also beneficial in easing itching (pruritus) and allergic skin reactions like hives (urticaria), especially when combined with corticosteroid creams or oral antihistamines[18].

IV. EXCIPIENTS USED IN LOTION FORMULATIONS

A. *Oily Components*

In lotion preparations, oily substances play a critical role as carriers for the active pharmaceutical ingredients. They assist in enhancing skin absorption, adjusting the product's thickness, and influencing the lotion's overall consistency. These excipients also contribute to the solubility of the drug, improve the physical integrity of the formulation, and aid in the controlled release and penetration of the drug into the skin layers. Commonly used oily ingredients include hydrocarbons, polyols, and both saturated and unsaturated fatty acids or their esters [19].

B. *Emulsifying Agents and Thickeners*

Since lotions are made up of both aqueous and oily components, which naturally do not mix, emulsifying agents are required to stabilize the mixture and prevent separation. Thickeners are also incorporated to raise the viscosity of the lotion, thereby limiting the movement of dispersed particles and minimizing the risk of phase separation. For instance, agents like methylcellulose and paraffin help maintain stability in oil-in-water and water-in-oil systems, respectively. Emulsifiers work by lowering the surface tension between the water and oil phases. Typically, ionic emulsifiers are applied in oil-in-water lotions, whereas nonionic ones are suitable for both types of emulsions [20].

C. *Preservatives and Antioxidants*

Due to their content of natural oils and fats, lotions are vulnerable to degradation through oxidation or microbial contamination. Antioxidants are added to slow down oxidative reactions, which can cause spoilage, odor changes, discoloration, and texture instability. The selection and concentration of antioxidants must be validated through testing to ensure effectiveness and compatibility with the other formulation components. Furthermore, microbial contamination—especially in oil-in-water systems—can lead to hydrolysis, pH fluctuations, and overall instability. To combat this, broad-spectrum preservatives are included, which must demonstrate strong antimicrobial properties, chemical stability, compatibility with other excipients, and effectiveness across varying pH levels and temperatures [21].

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D. Buffering Agents

Buffers are included to maintain the pH within a desired range, which helps preserve the chemical and physical properties of the lotion throughout its shelf life. A well-buffered system prevents drug degradation, ensures microbial resistance, and maintains formulation consistency. However, improper use of buffering agents can alter the lotion's flow characteristics and stability, making careful selection and testing essential to formulation success [22].

V. USES OF LOTIONS

Lotions play a crucial role in preserving the skin's moisture balance by sealing in hydration, which helps maintain a smooth, soft, and healthy appearance. Compared to creams, lotions typically contain a higher water content and are lighter, making them less greasy and easily absorbable. Some of their notable benefits include:

Alleviating skin dryness

Minimizing rough or flaky areas

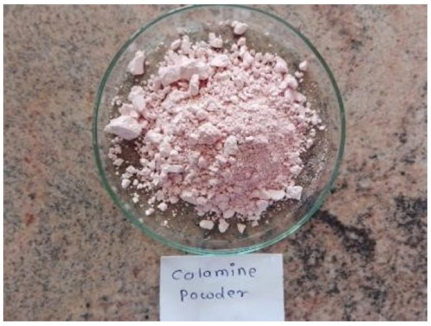
Enhancing overall skin texture and comfort

VI. FORMULATION

Sr.no.	Ingredients	For 30 ml
1.	Calamine	4.5 gm
2.	Zinc oxide	1.5 gm
3.	Glycerin	0.15 ml
4.	Bentonite	0.9 gm
5.	Rose water	0.15 ml

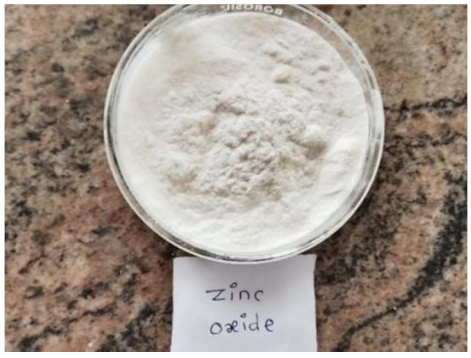
1) Calamine

A mix of zinc composites (substantially zinc oxide or carbonate) and ferric oxide, giving it a pink shade. It's valued for its soothing, antipruritic (anti-itch) parcels [23].



2) Zinc Oxide

A fine white greasepaint known for its skin-defensive, cooling, and UV-reflective rates. It also exhibits antibacterial action against S. aureus and P. aeruginosa, likely by dismembering bacterial cell structures [24].



3) Bentonite

A colloidal complexion (doused aluminum silicate) used to stabilize dormancies like shake poultices [25].

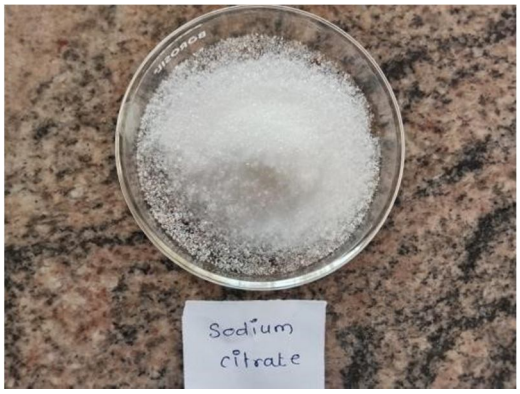


4) Glycerine

Acts as a humectant, emollient, and stabilizer — moisturizing the skin and enhancing product thickness [26].

5) Sodium Citrate

Maintains pH balance, icing product stability and skin comity [27].



VII. PLANT PROFILE

1) Tulsi(HolyBasil)



Botanical Name: Ocimum sanctum Linn. (O. tenuiflorum)
Family: Lamiaceae
Common Names: Tulsi, Holy Basil

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Habitat & Cultivation:
Native to India, Tulsi grows well in tropical regions and is commonly found in gardens and temples across the country [28].
Key Constituents:
It contains eugenol, linalool, ursolic acid, rosmarinic acid, flavonoids, essential oils, and vitamins A & C [29].
Description:
Tulsi is a fragrant, bushy herb with soft, serrated leaves and purple flowers. Its medicinal oils are concentrated in leaf glands. The square stem and aromatic nature are typical of the mint family [30].

2) Aloe vera



Botanical Name: Aloe barbadensis Miller Family: Asphodelaceae
Common Names: Aloe vera, Ghritkumari
Habitat & Cultivation:
Aloe vera thrives in hot, arid climates and is widely cultivated in dry regions of Africa, Asia, Europe, and the Americas. In India, it grows well in states like Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, and Tamil Nadu [31].
Key Constituents:
It contains vitamins (A, C, E, B12), enzymes, minerals, sugars, lignin, saponins, amino acids, salicylic acid, folic acid, and choline [32].

Description
A succulent with thick, spiny-edged leaves, Aloe vera stores water in its gel-rich inner layer. Each leaf has three parts:

- Gel – Moisture-rich with nutrients
- Latex – Bitter sap with anthraquinones
- Rind – Protective outer layer with vascular bundles

VIII. MATERIALS

1) Calamine – 15% w/v
2) Zinc oxide – 5% w/v
3) Glycerin-5%w/w
4) Bentonite – 7% w/w

IX. METHODS

1) Powder Processing – Sieving and blending of calamine and zinc oxide [21].
2) Aqueous Phase Preparation – Dissolving glycerin, sodium citrate, and preservative; adding bentonite magma [21].
3) Incorporation of Powders – Gradual addition to aqueous phase with stirring [21].
4) Volume Adjustment & Packaging – Final volume adjusted and stored in amber bottles [21].

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X. EVALUATION TESTS OF CALAMINE LOTION

1) Physical Appearance – Smooth, homogeneous, free of lumps [33].
2) pH Determination – Should lie between 6.0–8.0 [34].
3) Viscosity – Evaluated via Brookfield viscometer [35].
4) Spreadability – Measured using slide method [36].
5) Washability – Easily removed without residue [37]
6) Stability Testing – Conducted under accelerated conditions (25°C/60% RH, 40°C/75% RH) [38].
7) Microbial Limit Test – Absence of E. coli, S. aureus, P. aeruginosa [39].
8) Skin Irritation Test – Tested on human/animal skin under ethical protocols [40].
9) Sedimentation Volume – Measured for suspension stability [41].

XI. CONCLUSION

The evaluation of calamine lotion formulated with calamine, zinc oxide, bentonite, and glycerin confirms that it meets pharmaceutical standards for topical use. It exhibits desirable characteristics such as proper pH, spreadability, viscosity, and absence of irritation or microbial contamination. These properties support its application for skin irritation, rashes, and other dermatological conditions [21][33][38].

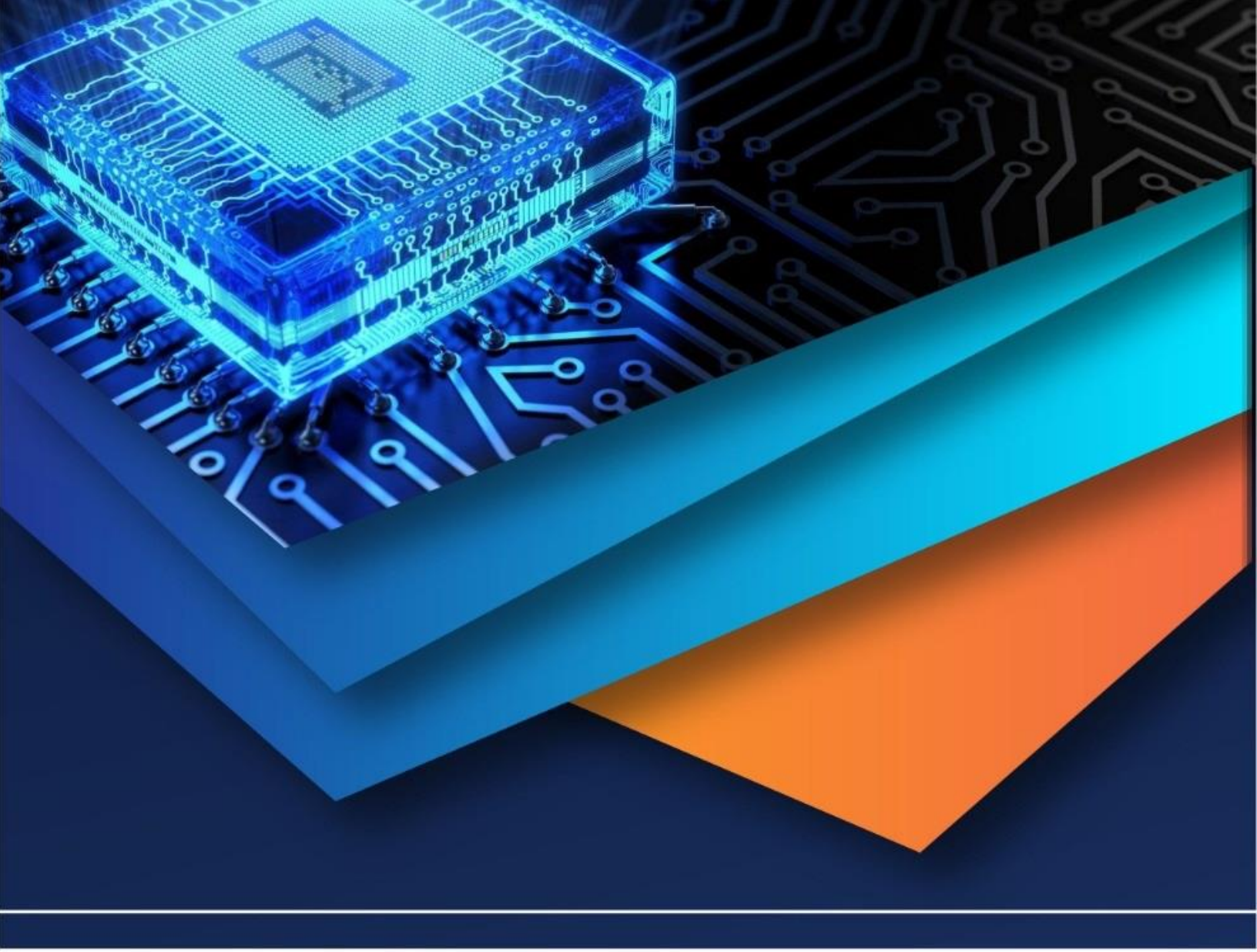
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