Review And Analytical Study of Polyherbal Cosmetic Cream

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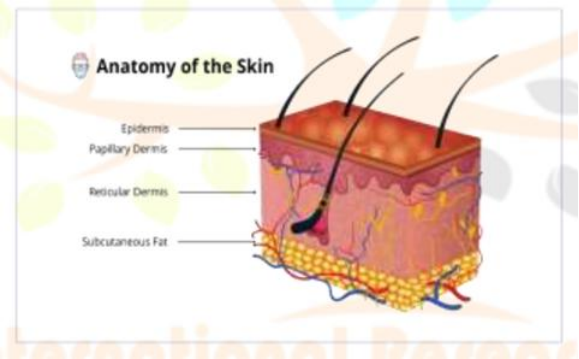
***Abstract*—This paper introduces an herbal cream formulated with aloe vera and calendula oil, highlighting its multifaceted benefits for skin health. Aloe vera, renowned for its hydrating and healing properties, provides deep moisture and soothes irritated skin, making it ideal for various skin types. Aloe vera, rich in vitamins A, C, and E, amino acids, and polysaccharides, offers exceptional moisturizing and anti-inflammatory properties, effectively soothing irritation and enhancing moisture retention. Calendula oil, derived from the marigold flower, offers potent anti-inflammatory and antiseptic benefits, promoting healing and protection against infections. Together, these ingredients create a synergistic effect that enhances their individual properties, resulting in a versatile skincare solution. The cream serves multiple purposes, including daily moisturizing, after-sun care, and post-shave soothing, making it suitable for a wide audience, including those with sensitive skin. By combining natural ingredients, this herbal cream not only addresses common skin concerns but also champions a holistic approach to skincare, celebrating the restorative power of nature.**

I. INTRODUCTION

The largest organ of the body is skin and it forms an ultimate shielding barricade against environmental stress enhancers such as transmittable pathogens, ultra-violet radiations, dust and chemical agents which causes ageing and other infections. The condition of general inner health and aging can be judged by skin.[1] A natural skin cosmetic should moisturize, hydrate and nourish the skin.[2] Cream is defined as semisolid emulsions which are oil in-water (o/w) or water-in-oil (w/o) type and these semisolid emulsions are intended for external application. Two phases of cream i.e., oil in-water and water-in-oil. [3]

It has important role in whitening of skin. [4] Excessive exposure to UV radiations causes Erythema, oedema, suntan, hyperplasia, early aging, [5] and skin cancer and is also responsible for generation of free radicals. [6,7] Further research into these phytochemicals has shown potential for treating various diseases, including hepatoprotective, antiviral, antifungal, antipyretic, antihistaminic, antimalarial, antibacterial, anti-inflammatory, and antioxidant activities [8].

These creams are evaluated for various parameters including physical characteristics, antimicrobial activity, and skin compatibility. [9,10] They contain natural antioxidants like vitamin C. Many other benefits can be seen with the use of herbal products such as; they are suitable for all skin types, more affordable than synthetic ones and wide selection to choose.[11]



II. MATERIAL AND METHOD

2.1. Plant Material and Extraction

The fresh leaves of *Aloe vera*, rhizomes of *Curcuma longa*, and leaves of *Azadirachta indica* were sourced locally and authenticated at the botanical department.

Aqueous Extraction (Aloe vera):

The fresh gel was carefully separated from the outer green rind under aseptic conditions, homogenized in a mechanical blender, and filtered through muslin cloth to obtain a clear liquid phase.

Ethanolic Extraction (Turmeric & Neem):
The rhizomes of Turmeric and leaves of Neem were air-dried under shade and pulverized into a coarse powder. The powders were subjected to exhaustive Soxhlet extraction using 70% ethanol as the solvent. The resulting extracts were filtered using Whatman No. 1 filter paper and concentrated under reduced pressure using a rotary vacuum evaporator to yield viscous, crude residues.

2.2. Formulation Methodology (Preparation of Cream)

An advanced oil-in-water (o/w) emulsion technique was employed as described below:

Oil Phase preparation:
Stearic acid, cetyl alcohol, almond oil, and beeswax were combined and melted together in a water bath maintained precisely at *70°C – 75°C*.

Aqueous Phase preparation:
Methylparaben, propylparaben, glycerin, and purified water were mixed thoroughly and heated to identical thermal conditions (*70°C – 75°C*).

Emulsification Process:
The heated oil phase was added dropwise to the hot aqueous phase with continuous, high-shear stirring using a laboratory mechanical homogenizer calibrated at 1200 rpm. Once the primary emulsion was successfully achieved, the system was allowed to cool slowly.

Incorporation of Actives:
When the emulsion core cooled to *40°C – 45°C*, the respective herbal extracts and neutralizing agents (triethanolamine) were incorporated under slow, uniform paddle stirring until a smooth, structurally elegant cream base was fully established.

III. FORMULA TABLE

The table below details the quantitative composition utilized to prepare the trial batches (*F*, *F*, and *F)* scaled to 100g totals:

INGREDIENTS	FUNCTIONAL ROLE	FORMULATION F1	FORMULATION F2	FORMULATION F3
Aloe vera gel	Moisturizer / Active Botanical	2.0 g	4.0 g	5.0 g
Curcuma longa extract	Antioxidant / Skin Tone Active	0.5 g	1.0 g	1.0 g
Azadirachta indica extract	Antimicrobial Active Agent	0.5 g	0.5 g	1.0 g
Stearic acid	Primary Emulsifier / Hardener	12.0 g	12.0 g	10.0 g
Cetyl alcohol	Stiffening Agent / Coemulsifier	2.0 g	2.0 g	3.0 g
Almond oil	Natural Emollient Base	4.0 mL	4.0 mL	5.0 mL
Glycerin	Humectant / Moisture Retainer	5.0 mL	5.0 mL	6.0 mL
Potassium hydroxide	Saponifying / pH Adjuster	0.5 g	0.5 g	0.5 g
Methylparaben	Antimicrobial Preservative	0.15 g	0.15 g	0.15 g
Propylparaben	Antifungal Preservative	0.05 g	0.05 g	0.05 g

Procedure Recap:

1. Heat Water Phase: Mix Aloe Vera Gel and Distilled Water in a container.
2. Heat Oil Phase: Combine Calendula Oil, Sweet Almond Oil, Coconut Oil/Jojoba Oil, and Emulsifying Wax in another container. Heat until the wax is melted.
3. Combine Phases: Pour the heated oil phase into the water phase while mixing continuously. Use an immersion blender for 1-2 minutes
4. Cool Down: Once cooled below 40°C (104°F), add Preservative, Vitamin E Oil, and Essential Oils (optional). Stir well.
5. Package & Store: Package the cream into sterilized jars or containers. Store in a cool, dark place

IV. EVALUATION

The developed topical polyherbal formulations were rigorously evaluated for the following physicochemical and safety indexes:

Organoleptic Characterization:
Visual inspections were performed to document color, odor, texture, transparency, and macro-structural appearance.

pH Determination:
Monitored using a calibrated digital pH meter at room temperature. Measurements were conducted by immersing the electrode directly into a 10% w/v aqueous dilution of the cream batch.

Homogeneity Testing:
Evaluated visually and via manual tactile sensation to check for the presence of particulate aggregates, crystalline precipitation, or unexpected phase separation over time.

Spreadability Analysis:
Measured using a custom-engineered double glass slide apparatus. The quantitative spreadability value.

Viscosity Measurements:
Rheological profiling was executed at room temperature (*25°C*) using a Brookfield Viscometer with spindle configurations set at a controlled rotational speed of 10–20 rpm.

In-Vivo Skin Irritation Screening:
Small volumes of formulated creams were applied to a *1 cm* area on the healthy forearms of human volunteers. The testing zone was actively checked for erythema, edema, or dynamic irritation indexes up to 24 hours post-application.

Accelerated Stability Testing:
Carried out in strict accordance with the International Council for Harmonisation (ICH) Q1A (R2) guidelines. Samples were kept inside stability chambers maintained at *40°C ± 2°C* and *75% ± 5% RH* for a duration of 3 months to monitor structural integrity.

V. RESULT

The physicochemical parameters compiled from the optimized batch *(F)* demonstrated optimal characteristics *3* ideal for cosmetic use. The data observations are structured in the analytical index below:

EVALUATION PARAMETER	OBSERVED QUANTITATIVE VALUE (BATCH F) 3	DERMATOLOGICAL INFERENCE
Color Profile	Light Yellowish Green	Aesthetically pleasing natural botanical hue
Odor Profile	Characteristic / Lightly Fragrant	Highly acceptable for cosmetic market entry
pH Value	6.2 ± 0.1	Perfectly compatible with the natural skin mantle
Homogeneity Score	Excellent	Uniform particle matrix; zero lump formation
Spreadability (g·cm/sec)	14.5 ± 0.3	Facilitates effortless topiary skin coverage
Viscosity Value (cps)	24,500 ± 450	Optimal semi-solid spread profile retention
Phase Separation Matrix	Absence of Coalescence / Phase Cleavage	High physical shelf-life stability
Skin Irritation Index	Non-irritant	Safe for broad clinical application

VI. DISCUSSION

The primary target of engineering a highly stable oil-in-water (o/w) polyherbal cosmetic cream was successfully achieved. Oil-in-water configurations remain widely favored because they easily deliver moisture and fat-soluble active botanical components into the deep epidermal layers without leaving a suffocating or greasy residual layer on the skin surface. The comparative analysis clearly verified that the structural metrics of formulation batch *F* were superior to *3* those of *F* and *F.* The balanced pairing of stearic acid and cetyl alcohol produced an ideal viscoelastic network, ensuring solid structural memory without reducing spreadability. The physiological pH of human skin naturally fluctuates between *4.5 – 6.5*. The optimized pH value of *6.2* verified for batch *F* confirms that the cream will not *3* disrupt the acid mantle or trigger inflammatory paths. The accelerated stability data confirmed that the botanical constituents remained stable, proving that the formulation resists degradation even at elevated temperatures.

VII. CONCLUSION

The experimental conclusions confirm that an elegantly stable, effective, and safe polyherbal cream can be formulated using the combined crude extracts of *Aloe vera*, *Curcuma longa*, and *Azadirachta indica*. The optimized formulation (*F)* achieved ideal physical features, premium spreadability, and a highly compatible skin pH. The complete lack of irritation and structural breakdown during testing underscores its real commercial potential as a daily cosmetic product. Future work will focus on long-term in vivo anti-aging and anti-acne clinical efficacy trials.

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