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Research Article

FORMULATION AND EVALUATION OF AN HERBAL ALOE–CUCUMBER FACE CREAM FOR TOPICAL SKINCARE APPLICATIONS

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Abstract

Herbal cosmetics have gained considerable attention in modern dermatological and cosmetic sciences owing to their perceived safety, biocompatibility, and therapeutic benefits compared with synthetic formulations. Natural plant-derived ingredients offer multifunctional effects including moisturization, antioxidant protection, soothing action, anti-inflammatory activity, and skin barrier enhancement. Among herbal ingredients, Aloe vera and cucumber (Cucumis sativus) have been extensively recognized for their hydrating, cooling, and skin-rejuvenating properties. The present study aimed to formulate and evaluate a herbal face cream containing aloe vera and cucumber extracts for topical skincare application. The formulation was designed using naturally derived active ingredients along with suitable excipients including coconut oil, vitamin E, sandalwood powder, corn flour, xanthan gum, glycerine, propylene glycol, zinc oxide, methyl paraben, and rose water. The cream was prepared using a semisolid emulsion-based formulation approach involving aloe gel extraction, cucumber juice incorporation, active ingredient blending, emulsification, preservative incorporation, and stabilization. Evaluation parameters included organoleptic properties, pH determination, consistency, viscosity, Spreadability, stability, skin compatibility, and preservative efficacy. The prepared formulation exhibited acceptable physicochemical characteristics with light green color, pleasant odor, opaque appearance, smooth texture, medium viscosity, pH of 5.2, stable equilibrium, and drying time of 8 seconds. These findings suggest that the developed herbal aloe–cucumber face cream demonstrates promising potential as a safe, stable, and cosmetically acceptable topical skincare formulation. The study supports the increasing applicability of herbal cosmetic preparations as alternatives to conventional synthetic skincare products.

Keywords: Aloe vera, cucumber, herbal cosmetics, face cream, topical formulation, skincare, natural moisturizer

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1. Introduction

Cosmetics have historically played an essential role in personal care, aesthetic enhancement, and skin protection. The term "cosmetic" originates from the Greek word kosmetikos, meaning adornment or beautification. Over time, cosmetic science has evolved from rudimentary preparations to sophisticated dermatological formulations designed not only for aesthetic purposes but also for therapeutic skin maintenance.

Among topical cosmetic preparations, creams remain one of the most widely accepted semisolid dosage forms because of their convenience, ease of application, patient compliance, and formulation flexibility. Creams are generally emulsified semisolid preparations containing oil and aqueous phases stabilized by emulsifying agents. Depending on their composition, they are commonly categorized as oil-in-water (O/W) or water-in-oil (W/O) systems. Oil-in-water creams are generally preferred in facial cosmetic formulations because they are non-greasy, rapidly absorbed, cosmetically elegant, and easily washable (Ansel et al., 1995; Mohiuddin, 2019).

The increasing global demand for herbal cosmetics has stimulated significant research into plant-based skincare formulations. Consumers increasingly prefer herbal products due to concerns regarding irritation, hypersensitivity, synthetic chemical toxicity, and long-term dermatological adverse effects associated with conventional formulations. Herbal ingredients often provide multifunctional biological activities including antioxidant, anti-inflammatory, antimicrobial, moisturizing, photoprotective, and wound-healing effects (Sahu et al., 2016).

Aloe vera (Aloe barbadensis Miller) is one of the most extensively investigated medicinal plants in dermatological applications. It contains polysaccharides, amino acids, vitamins, enzymes, anthraquinones, sterols, and minerals that contribute to moisturizing, soothing, anti-inflammatory, and skin-repair properties. Aloe vera is particularly effective in improving hydration, reducing irritation, supporting collagen synthesis, and promoting epithelial regeneration.

Cucumber (Cucumis sativus) is another widely recognized botanical ingredient in skincare applications. It contains high water content, vitamin C, caffeic acid, flavonoids, and silica, making it valuable for skin hydration, soothing irritated skin, reducing puffiness, and improving complexion. Its anti-inflammatory and cooling effects make cucumber particularly suitable for facial cosmetic formulations intended for sensitive or irritated skin.

Additional formulation excipients contribute significantly to product performance. Coconut oil functions as an emollient and barrier-enhancing moisturizer; vitamin E serves as an antioxidant; glycerine and propylene glycol act as humectants; xanthan gum improves viscosity and stability; zinc oxide provides protective and soothing effects; and rose water enhances sensory appeal while offering mild anti-inflammatory benefits.

The present study was undertaken to formulate and evaluate a herbal aloe–cucumber face cream intended for daily topical skincare use. The objective was to develop a cosmetically acceptable, stable, non-greasy, hydrating, and skin-compatible herbal cream using natural bioactive ingredients.

2. Materials and Methods

a. Materials

The herbal face cream formulation was prepared using the following ingredients: aloe vera extract, cucumber extract, coconut oil, vitamin E, sandalwood powder, corn flour, xanthan gum, methyl paraben, glycerine, propylene glycol, zinc oxide, and rose water.

Table 1: Composition of Formulation

Sr. No.	Ingredient	Category	Quantity
1	Aloe Vera	Herbal Extract	20 g
2	Cucumber	Herbal Extract	10 g

3	Coconut Oil	Emollient	5 mL
4	Vitamin E	Antioxidant	2 mL
5	Sandalwood Powder	Aromatic Agent	2 g
6	Corn Flour	Soothing Agent	3 g
7	Xanthan Gum	Moisturizer/Stabilizer	8 g
8	Methyl Paraben	Preservative	2 mL
9	Glycerine	Moisturizer	1 mL
10	Propylene Glycol	Humectant/Binder	1 mL
11	Zinc Oxide	Protective Agent	2 g
12	Rose Water	Vehicle	q.s.

b. Method of Preparation

Preparation of Aloe Vera Gel

Fresh aloe vera leaves were thoroughly washed with purified water to eliminate contaminants and surface impurities. The thorny margins were carefully removed, and the outer green epidermal layer was peeled to isolate the transparent mucilaginous gel. The extracted gel was collected aseptically and blended until a homogeneous consistency was achieved.

Xanthan gum was dispersed separately in a small portion of the aloe gel to allow complete hydration and swelling. The hydrated xanthan gum mixture was then incorporated into the bulk aloe gel with continuous stirring to obtain a stable gel base. The prepared gel was refrigerated for several hours to improve consistency and structural stability .

Preparation of Cucumber Extract

Fresh cucumber fruits were thoroughly cleaned and grated mechanically. The grated material was filtered through clean muslin cloth to obtain cucumber juice. The filtrate was collected under hygienic conditions and used immediately to preserve bioactive integrity.

Preparation of Herbal Face Cream

The prepared aloe vera gel and cucumber extract were combined to form the aqueous phase of the formulation. In a separate container, coconut oil, vitamin E, glycerine, and propylene glycol were mixed thoroughly.

Powdered ingredients including sandalwood powder, corn flour, and zinc oxide were gradually incorporated into the oily phase to form a smooth dispersion free from agglomerates.

The oil-based active dispersion was then slowly added to the aloe–cucumber aqueous phase under continuous stirring to promote emulsification and achieve homogeneous cream formation. Methyl paraben dissolved in warm purified water was subsequently incorporated as preservative.

Rose water was added as vehicle to adjust final consistency and improve organoleptic properties. The resulting cream was mixed continuously until a uniform semisolid consistency was achieved and allowed to stabilize before evaluation.

c. Evaluation Parameters

The formulated herbal cream was evaluated using standard physicochemical and cosmetic quality assessment methods.

Organoleptic Evaluation

Visual and sensory examination was performed to assess color, odor, appearance, smoothness, and texture. Organoleptic acceptability is essential for cosmetic consumer compliance.

pH Determination

The pH of the formulation was determined using calibrated digital pH measurement methods. Maintaining pH near physiological skin pH is essential to minimize irritation and preserve skin barrier function.

Consistency and Viscosity

Consistency and rheological characteristics were evaluated by observing semisolid behavior,

structural uniformity, and application characteristics.

Spreadability

Spreadability was assessed to determine ease of application and uniform topical distribution.

Stability Study

The prepared cream was evaluated for physical stability including phase separation, consistency changes, odor variation, and appearance alteration under storage conditions.

Skin Compatibility

Basic skin compatibility assessment was performed to evaluate potential irritation, redness, or intolerance.

Preservative Efficacy

Preservative effectiveness was evaluated to assess microbial protection and shelf-life suitability.

3. Results and Discussion

a. Results

The prepared herbal aloe–cucumber face cream was successfully formulated as a stable semisolid cosmetic preparation intended for topical skincare application. The formulation demonstrated acceptable physical, aesthetic, and functional characteristics consistent with requirements for facial cosmetic preparations.

The cream exhibited a light green appearance, which was attributable to the incorporation of aloe vera and cucumber extracts. The odor was pleasant and acceptable, enhancing consumer acceptability. The formulation showed an opaque appearance and smooth homogeneous texture, indicating successful blending and dispersion of the constituent ingredients.

Physicochemical evaluation demonstrated satisfactory product characteristics. The measured pH of the cream was 5.2, which falls within the acceptable physiological range for topical skin application and is compatible with the natural acidic mantle of human skin. Maintenance of this pH is essential for preserving skin barrier integrity, reducing irritation potential, and minimizing disruption of normal microbial flora.

The cream demonstrated medium viscosity, indicating balanced rheological behavior. Excessively viscous creams may be difficult to spread, whereas low-viscosity creams may exhibit poor retention and phase instability. The observed viscosity suggested appropriate formulation consistency for facial application.

The drying time was recorded as 8 seconds, indicating relatively rapid absorption and acceptable non-greasy cosmetic performance. Rapid drying is particularly desirable in facial formulations intended for daily use, as it improves user convenience and reduces residue formation.

The formulation remained in stable equilibrium, with no visible evidence of phase separation, precipitation, or organoleptic deterioration during the observation period.

Table 2: Physicochemical Evaluation of Aloe–Cucumber Face Cream

Evaluation Parameter	Observation
Colour	Light Green
Odour	Pleasant
Appearance	Opaque
Texture	Smooth
Stability	Stable
pH	5.2
Viscosity	Medium
Drying Time	8 seconds

4. Discussion

The present investigation successfully demonstrated the formulation and evaluation of a herbal face cream incorporating aloe vera and cucumber as principal active ingredients. Herbal topical preparations have gained increasing relevance due to growing consumer preference for naturally derived cosmetic products with reduced synthetic chemical exposure.

The success of the present formulation can be attributed to the synergistic effects of its botanical and supportive excipients.

a. Role of Aloe Vera

Aloe vera is widely recognized for its dermatological benefits due to the presence of polysaccharides, glycoproteins, vitamins, enzymes, amino acids, and antioxidants. Its hydrophilic mucopolysaccharide content contributes significantly to skin hydration by retaining moisture in the stratum corneum. Furthermore, aloe vera exhibits anti-inflammatory and wound-healing properties, making it particularly suitable for facial skincare formulations intended for soothing irritated skin.

The incorporation of aloe vera in the present cream likely contributed to the formulation's hydrating characteristics, smooth consistency, and soothing topical potential.

b. Role of Cucumber Extract

Cucumber is extensively used in skincare because of its high-water content, antioxidant profile, and cooling properties. It contains flavonoids, tannins, vitamin C, and silica, all of which support hydration, antioxidant defense, and skin calming effects.

Its inclusion in the present formulation likely enhanced the cooling sensation, moisturization, and refreshing cosmetic characteristics of the cream. The observed rapid drying time may partially reflect the aqueous composition contributed by cucumber extract.

c. Contribution of Supportive Excipients

Several excipients significantly influenced formulation performance:

Coconut oil functioned as an emollient, improving softness and barrier protection.

Vitamin E provided antioxidant stabilization and potential skin protective effects.

Glycerine and propylene glycol served as humectants, enhancing water retention and hydration.

Xanthan gum improved viscosity and prevented phase separation.

Zinc oxide contributed protective and soothing functionality.

Sandalwood powder improved aromatic quality and may provide additional anti-inflammatory benefits.

Methyl paraben enhanced microbial stability.

Rose water improved sensory acceptability and vehicle performance.

The successful integration of these ingredients resulted in a cosmetically elegant semisolid formulation.

d. pH Suitability

The measured pH of 5.2 is particularly significant for topical compatibility. Human skin generally maintains a mildly acidic pH between 4.5 and 6.0, which supports epidermal barrier integrity and microbiological defense.

A formulation with inappropriate pH may result in skin irritation, dryness, barrier disruption, altered microbial flora, increased sensitivity.

The observed pH suggests the present formulation is suitable for routine facial application.

e. Stability Considerations

Stability is a critical determinant of cosmetic product quality. The absence of visible phase separation or instability suggests adequate emulsion formation and structural compatibility among ingredients.

Xanthan gum likely played a major stabilizing role by increasing viscosity and reducing droplet mobility within the semisolid matrix.

The preservative system also supports formulation integrity by reducing microbial spoilage risk, particularly important due to inclusion of fresh botanical materials such as aloe and cucumber.

f. Cosmetic Acceptability

Consumer acceptance of topical skincare products depends heavily on sensory and application characteristics.

The present cream demonstrated favorable cosmetic attributes: smooth texture, pleasant

odor, moderate viscosity, acceptable drying time, non-greasy feel, stable appearance.

These characteristics align with expectations for modern facial moisturizers and herbal cosmetic preparations.

g. Comparison with Existing Herbal Cream Literature

Previous investigations of herbal creams have similarly reported favorable physicochemical characteristics when botanical actives are incorporated into properly stabilized semisolid formulations.

Sahu et al. (2016) described herbal skin creams as effective topical delivery systems capable of combining therapeutic and cosmetic benefits. Mohiuddin (2019) similarly emphasized the growing significance of herbal skincare formulations due to their multifunctional biological effects and consumer safety perception.

The present findings are consistent with these reports, particularly regarding acceptable pH, semisolid stability, consumer-friendly rheology, topical compatibility.

h. Limitations of the Study

Despite the encouraging findings observed in the present study, certain limitations should be acknowledged. The analytical evaluation of the formulated herbal face cream was limited, as advanced rheological characterization and instrumental texture analysis were not performed to comprehensively assess the formulation's mechanical and flow properties. Although the formulation included a preservative system, full microbiological challenge testing against specific bacterial and fungal strains was not conducted, limiting the confirmation of preservative efficacy and microbiological safety over prolonged storage. Furthermore, accelerated stability studies under controlled environmental conditions such as varying temperature and humidity were not carried out, making the long-term storage stability and shelf-life behavior of the formulation uncertain. The dermatological performance of the cream was also not extensively evaluated through controlled clinical studies involving human volunteers, which restricts conclusions regarding safety, irritation potential, and real-world efficacy. In addition, quantitative instrumental assessments of therapeutic or cosmetic outcomes such as skin hydration improvement, anti-inflammatory activity, skin brightening effects, and barrier enhancement were not performed. Future investigations should address these limitations through advanced analytical testing, microbiological validation, accelerated stability studies, and controlled clinical evaluations to further establish the safety, efficacy, and commercial applicability of the formulation.

5. Conclusion

The present study successfully formulated and evaluated a herbal aloe–cucumber face cream for topical skincare application.

The developed formulation demonstrated acceptable physicochemical properties including smooth texture, pleasant odor, stable semisolid consistency, medium viscosity, rapid drying behavior, skin-compatible pH (5.2).

The combination of aloe vera and cucumber provided a rational botanical basis for hydration, soothing action, antioxidant support, and cosmetic enhancement.

Supportive excipients further improved formulation stability, moisturization, and sensory acceptability.

The findings indicate that the developed herbal cream possesses promising potential as a natural topical cosmetic preparation suitable for daily skincare use.

Further investigations involving advanced stability studies, microbiological assessment, and clinical dermatological evaluation are recommended to establish broader commercial and therapeutic applicability.

6. References

1. Shah RN, Mehta BM. A Handbook of Cosmetics.
2. Myers D. Surfactant Science and Technology. VCH Publishers; 1992.
3. Sahu T, Patel T, Sahu S, Gidwani B. Skin cream as topical drug delivery system: A review. J Pharm Biol Sci. 2016;4(5):149–154.

4. James WD, Berger TG, Elston DM. Andrews' Diseases of the Skin: Clinical Dermatology. 10th ed. Elsevier Saunders; 2006.

5. Ross and Wilson. Anatomy and Physiology in Health and Illness. 11th ed.

6. Ansel HC, Popovich NG, Allen LV. Pharmaceutical Dosage Forms and Drug Delivery Systems. Lippincott Williams & Wilkins; 1995.

7. Rai R, Poudyl AP, Das S. Pharmaceutical creams and their use in wound healing: A review. J Drug Deliv Ther. 2019;9(3):907–912.

8. Mohiuddin AK. Skin care creams: Formulation and use. Am J Dermatol Res Rev. 2019;2:8.

9. Dash A, Singh S, Tolman J. Pharmaceutics: Basic Principles and Application to Pharmacy Practice. Academic Press; 2013.

10. Swarbrick J, Rubino JT. Remington: The Science and Practice of Pharmacy. Lippincott Williams & Wilkins; 2006.