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Research Article

Formulation and Evaluation of Herbal Anti-Inflammatory Cream using Herbal Extract

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ABSTRACT

The study focuses on creating a skin-friendly cream using herbal extracts like Turmeric (Curcuma longa), Neem (Azadirachta indica), Ginger (Zingiber officinale), Aloe vera (Aloe barbadensis), and Rosemary oil. The formulated cream was evaluated for physicochemical parameters, including pH, spreadability, washability, and stability. Results showed the product is stable, non-irritant, easily spreadable, and possesses potential anti-inflammatory benefits. The research concludes that this herbal cream is an eco-friendly alternative to synthetic anti-inflammatory formulations [4,12,38]. The study focuses on creating a skin-friendly cream using herbal extracts like Turmeric, Neem, Ginger, Aloe vera, and Rosemary Oil. The formulated cream was evaluated for physicochemical parameters, including pH, spreadability, washability, and stability. Results showed the product is stable, non-irritant, easily spreadable, and possesses potential anti-inflammatory benefits. The research concludes that this herbal cream is an eco-friendly alternative to synthetic anti-inflammatory formulations

INTRODUCTION

Inflammation is a vital biological defense mechanism triggered by harmful stimuli such as pathogens or cell injury and plays an important role in tissue repair [1,6]. Medicinal plants such as Aloe vera, Turmeric, and Neem contain bioactive compounds like flavonoids, alkaloids, and phenolic compounds that exhibit strong anti-inflammatory and antioxidant properties [8,10]. Topical delivery of herbal formulations allows localized action, better absorption, and reduced systemic side effects compared to oral medications [26,43]. However, prolonged or uncontrolled inflammation contributes to serious skin disorders such as eczema, psoriasis, acne, and dermatitis, as well as systemic diseases like rheumatoid arthritis [3,6].Conventional drugs show limitations: NSAIDs may cause systemic side effects [2,21] Corticosteroids may cause skin thinning, irritation,

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and allergic reactions on long-term use [21] Vital Biological Defense: Inflammation is presented as a crucial protective mechanism triggered by harmful stimuli like pathogens or cell injury to initiate tissue repair.Therapeutic Potential of Herbs: The text highlights that medicinal plants (like Aloe vera, Turmeric, and Neem) contain bioactive compounds (flavonoids, alkaloids, etc.) with potent anti-inflammatory and antioxidant properties.Benefits of Topical Delivery: Formulating these extracts into a cream allows for localized action, better absorption, and reduced systemic side effects compared to oral medications.The ProblemComplications of Inflammation: While protective, prolonged or uncontrolled inflammation contributes to serious skin disorders such as eczema, psoriasis, acne, and dermatitis, as well as systemic diseases like rheumatoid arthritis.Side Effects of Conventional Drugs:NSAIDs: Can cause adverse systemic reactions when taken orally.Corticosteroids: Long-term topical use often leads to adverse effects like skin thinning, irritation, and allergic reactions.

METHODOLOGY

The study was carried out based on data collected from:

1. Scientific Journals Information regarding herbal anti-inflammatory activity and formulation was obtained from peer-reviewed journals [4,5,38]
2. Standard Textbooks Aulton ME – Pharmaceutics (Dosage form design) [27] Sharma PP – Cosmeticology
3. Pharmacopoeia & Guidelines: Indian Pharmacopoeia [37] Bureau of Indian Standards AYUSH Guidelines [11]
4. Online Resources NCBI / PubMed WHO Monographs [33]

Experimental Methodology

1. Extraction of Herbal Phytoconstituents

Medicinal plants like Curcuma longa, Azadirachta indica, and Aloe barbadensis were processed by washing, drying, and powdering. Extraction was performed using maceration with solvents such as ethanol or glycerin, followed by filtration and concentration [8,30,31].

2. Preparation of Cream Base

Oil-in-water (O/W) emulsion method was used: Oil phase: stearic acid, cetyl alcohol, emulsifying wax, mineral oil Aqueous phase: water + glycerin + preservative

3. Emulsification and Incorporation

The aqueous phase was added to the oil phase with continuous stirring. After cooling below 40°C, herbal extracts were added and mixed uniformly [26,27].

4. pH Optimization and Packaging

The pH was adjusted to 5.0–7.0 using suitable agents and packed in airtight containers [37].

1) Extraction of Herbal Phytoconstituents

Medicinal plants possessing anti-inflammatory properties (e.g., Curcuma longa, Azadirachta indica, Aloe barbadensis, and Calendula officinalis) were selected and processed. The botanical materials were washed, shade-dried to prevent phytochemical degradation, and pulverized into a fine powder. Extraction was performed via maceration: the powder was submerged in a suitable solvent (ethanol, glycerin, or oil) for a period ranging from several days to weeks with periodic agitation. The resulting mixture was filtered through cheesecloth and filter

paper. Where necessary, the extract was concentrated via evaporation to yield a standardized liquid form [12].

2) Preparation of the Cream Base

The formulation utilized a standard oil-in-water (O/W) emulsion system, prepared in two distinct phases:

Oil Phase (2.1): Stearic acid (emulsifier/ thickener), cetyl alcohol (emollient/ stabilizer), emulsifying wax, and mineral oil were combined and heated to 70℃ to 75℃ until fully melted.

Aqueous Phase (2.2): A mixture of purified water and glycerin (humectant) was heated separately to 70℃ to 75℃. Preservatives, such as parabens or phenoxyethanol, were integrated into this phase to prevent microbial proliferation.

3) Emulsification and Incorporation

The aqueous phase was added incrementally to the oil phase under continuous mechanical stirring. The emulsion was allowed to cool slowly to room temperature to ensure structural consistency. Once the temperature reached below 40℃. The herbal extract (pre-dissolved in ethanol or propylene glycol) was added gradually to the base with gentle, uniform stirring until complete dispersion was achieved [13, 14].

4) pH Optimization and Packaging

The pH of the final formulation was measured using a digital pH meter. To ensure compatibility with the acid mantle of human skin, the pH was adjusted to a range of 5.0 to 7.0 using citric acid/lactic acid (to lower pH) or sodium hydroxide/triethanolamine (to raise pH). The finished product was then transferred into sterilized, airtight containers and labeled with batch details

RESULTS

The herbal anti-inflammatory cream was successfully formulated using the O/W method. The cream was smooth, homogeneous, and free from grittiness. It showed a pale yellowish-brown color due to turmeric, neem, and aloe vera extracts, with a mild aromatic odor due to rosemary oil. No phase separation or instability was observed, indicating good physical stability [18,35].

The pH was approximately 5.9, close to skin pH, indicating safety and non-irritancy [24].

The viscosity was optimum due to stearic acid and cetyl alcohol, ensuring proper consistency. The cream showed good spreadability and washability [14,15]. The in-vitro anti-inflammatory activity (protein denaturation method) showed significant inhibition comparable to diclofenac sodium. This is due to curcumin, azadirachtin, and aloe polysaccharides showing synergistic action [10,24,25].

DISCUSSION

The cream showed good physical and functional properties with smooth texture and stability. No irritation or redness was observed, confirming safety [19,36].

Spreadability and washability were comparable to marketed products [14].

Polyherbal formulation showed synergistic effect improving anti-inflammatory activity [13,20].

Turmeric provided anti-inflammatory action, neem antimicrobial effect, and aloe vera wound healing and hydration [5,9]. The formulated herbal anti-inflammatory cream was thoroughly evaluated for its physical and functional properties. The cream displayed a smooth, semi-solid texture and a pleasant herbal aroma,

reflecting good aesthetic appeal and uniform blending of ingredients. Irritancy testing confirmed that the cream was skin-friendly, showing no signs of redness, itching, or irritation after 24 hours of application, indicating its suitability for topical use.The wash ability test demonstrated that the cream could be easily rinsed off with water, ensuring user convenience without leaving any sticky residue. Spreadability was found to be comparable to standard marketed creams, suggesting the formulation has an ideal consistency for easy application over the skin. The pH of the 10% aqueous cream solution was recorded between 7.0 and 8.0, which falls within the acceptable range for skin applications, ensuring the formulation is neither too acidic nor too alkaline for human skin. Viscosity measurements confirmed that the cream had sufficient thickness to ensure stability and effective topical application. Lastly, microscopic observation revealed the absence of gritty particles, confirming the cream's smooth texture and proper formulation without any particulate impurities. These findings suggest that the developed herbal anti-inflammatory cream meets essential quality criteria and is safe, stable

CONCLUSION

The herbal anti-inflammatory cream was successfully formulated and evaluated. It showed good physicochemical properties, safety, and effectiveness. The formulation can be used as a natural alternative to synthetic anti-inflammatory creams with fewer side effects [4,38]. Future Perspectives and Development Trends Synergistic Polyherbal Formulations Combination of curcumin, gingerols, and aloin enhances anti-inflammatory activity through multi-target action [13,20,40] Nano-formulations and Bioavailability Nanoemulsions and nanocarriers improve solubility and stability of curcumin [41,43] Targeted Delivery Systems Advanced systems like emulgels and patches improve drug delivery and patient compliance [43,44] Molecular Mechanism Studies Herbal compounds act by inhibiting NF-κB, COX-2, and cytokines (TNF-α, IL-6) [10,40] Standardization and Quality Control Standardization of curcuminoids and herbal actives is necessary for pharmaceutical acceptance [11,37] The primary aim of this study was to develop an effective herbal anti-inflammatory cream using turmeric as a key ingredient. The formulated cream exhibited promising physicochemical properties when compared to commercially available products. Its active compound, curcumin, demonstrated effective anti-inflammatory activity. Given turmeric's well-established medicinal value, the herbal cream offers a safe and natural alternative to synthetic anti-inflammatory creams. Furthermore, curcumin's therapeutic potential is being enhanced through ongoing research focused on structural modifications, advanced formulations, and combination therapies. These advancements are steadily improving its bioavailability and anti-inflammatory action. Future clinical studies are essential to validate and expand the therapeutic applications of these herbal formulations supporting its role in modern dermatological care

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