

FORMULATION AND EVALUATION OF POLYHERBAL ANTIINFLAMMATORY GEL

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I . ABSTRACT

The present study focuses on the formulation and evaluation of a polyherbal anti-inflammatory gel using natural herbal ingredients. Inflammation is a protective response of the body that is commonly associated with pain, redness, swelling, and discomfort. Herbal medicines have gained considerable attention due to their safety, affordability, easy availability, and reduced risk of adverse effects compared to synthetic medications.

The polyherbal gel was formulated using extracts of Neem (*Azadirachta indica*), Turmeric (*Curcuma longa*), Tulsi (*Ocimum sanctum*), and Aloe vera. These medicinal plants are widely recognized for their anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. The selected herbal extracts were incorporated into a suitable gel base to obtain a smooth, uniform, and stable topical formulation.

The prepared gel was evaluated for various quality parameters, including appearance, pH, viscosity, homogeneity, spreadability, extrudability, washability, stability, and skin irritation. The evaluation results indicated that the formulation possessed good physical characteristics, acceptable pH, satisfactory viscosity, and excellent homogeneity. Stability studies revealed no significant changes during storage, and the skin irritation test confirmed that the formulation was safe for topical application.

Based on the findings, the developed polyherbal anti-inflammatory gel can be considered an effective, stable, economical, and user-friendly herbal

formulation for the management of inflammatory conditions. The study highlights the potential of herbal ingredients as safer alternatives for topical anti-inflammatory therapy.

KEYWORDS: Herbal liquid mouth freshener, Oral hygiene, Halitosis, Herbal formulation, Peppermint oil, Clove oil, Menthol, Cardamom extract, Fennel extract, Natural oral care, Physicochemical evaluation, Herbal oral healthcare.

II .INTRODUCTION

Inflammation is a natural protective response of the body against injury, infection, or harmful stimuli. It is commonly characterized by symptoms such as redness, swelling, pain, heat, and temporary loss of function. Although inflammation plays an important role in the healing process, prolonged or chronic inflammation can contribute to various health problems, including arthritis, skin disorders, muscle pain, and other inflammatory conditions.

Conventional anti-inflammatory drugs are widely used for the management of inflammation; however, their long-term use may be associated with adverse effects such as gastrointestinal irritation, allergic reactions, and skin sensitivity. As a result, there has been growing interest in herbal medicines, which are considered safer, cost-effective, and more suitable for prolonged use.

Medicinal plants contain a variety of bioactive compounds, including flavonoids, alkaloids, tannins, terpenoids, and phenolic constituents, which possess significant anti-inflammatory, antioxidant,

antimicrobial, and wound-healing activities. Polyherbal formulations, which combine multiple medicinal herbs, are often preferred because the combined action of different plant constituents may enhance therapeutic effectiveness while minimizing unwanted effects.

The present study focuses on the formulation and evaluation of a polyherbal anti-inflammatory gel containing Neem (*Azadirachta indica*), Turmeric (*Curcuma longa*), Aloe vera, and Tulsi (*Ocimum sanctum*). Neem is known for its antimicrobial and anti-inflammatory properties, Turmeric contains curcumin which exhibits potent anti-inflammatory and antioxidant activity, Aloe vera provides soothing and wound-healing effects, while Tulsi contributes antimicrobial and protective benefits. The combination of these herbal ingredients is expected to provide effective relief from inflammation and associated skin discomfort.

Topical gels are widely accepted drug delivery systems because they are non-greasy, easy to apply, washable, and capable of delivering active ingredients directly to the affected area. Compared to oral therapy, topical preparations reduce systemic side effects and improve patient compliance. Due to these advantages, herbal gels have gained considerable importance in pharmaceutical and cosmetic applications.

The successful development of a polyherbal anti-inflammatory gel requires the selection of appropriate herbal extracts, gelling agents, preservatives, and other excipients. Evaluation parameters such as appearance, pH, viscosity, homogeneity, spreadability, stability, and skin compatibility are essential for assessing the quality, safety, and performance of the final formulation.

III. MATERIALS AND METHODS

A. MATERIALS

The materials used for the formulation of Polyherbal Anti-inflammatory Gel were selected based on their anti-inflammatory, antimicrobial, soothing, and stabilizing properties. The composition of the formulation is given below:

B. INGREDIENTS

The formulation consisted of Carbopol 934 (1 g), Propylene Glycol (0.5 g), Ethyl Paraben (0.18 g), Propyl Paraben (0.02 g), Turmeric (3 g), Tulsi (2 g), Aloe vera (10 g), Ginger (2 g), and Neem (5 g). Carbopol 934 was used as a gelling agent, while Propylene Glycol acted as a humectant and penetration enhancer. Ethyl Paraben and Propyl Paraben were incorporated as preservatives. The herbal ingredients, namely Turmeric, Tulsi, Aloe vera, Ginger, and Neem, were selected for their anti-inflammatory, antimicrobial, antioxidant, soothing, and wound-healing properties. These ingredients were combined to prepare a stable and effective polyherbal anti-inflammatory gel.

IV. METHOD OF PREPARATION

1. Carbopol 934 was accurately weighed and dispersed in a sufficient quantity of purified water with continuous stirring to obtain a uniform gel base.
2. Ethyl Paraben and Propyl Paraben were dissolved in Propylene Glycol and mixed thoroughly until a clear solution was obtained.
3. The herbal ingredients, namely Turmeric extract, Tulsi extract, Aloe vera gel, Ginger extract, and Neem extract, were weighed separately and blended to form a uniform herbal mixture.
4. The preservative solution was slowly incorporated into the Carbopol dispersion under continuous stirring to ensure uniform distribution.
5. The prepared herbal mixture was then gradually added to the gel base and mixed continuously until a homogeneous formulation was obtained.
6. The final gel was stirred thoroughly to remove lumps and achieve smooth consistency. The prepared formulation was transferred into suitable containers and stored at room temperature for further evaluation.

V. RESULT

ORGANOLEPTIC PROPERTIES

Sr.no.	Parameter	Observation
1	Colour	Light greenish brown
2	Odour	Characteristics Herbal odour
3	Appearances	Smooth and uniform
4	Texture	Soft gel
5	Consistency	Good

PHYSICOCHEMICAL EVALUATION

Sr.No.	Parameter	Observation
1	pH	6.8 -7.25
2	Viscosity	Moderate viscosity
3	Homogeneity	Uniform distribution
4	Spreadability	Good
5	Washability	Easily washable

QUALITY CONTROL PARAMETERS

Sr.no.	Parameter	Observation
1	Physical appearance	Acceptable
2	Grittiness	Absent
3	Skin irritation	No irritation
4	Uniformity	Pass
5	Microbial growth	Not detected

VI. DISCUSSION

The present study focused on the formulation and evaluation of a polyherbal anti-inflammatory gel

using selected herbal ingredients known for their therapeutic potential. The prepared gel exhibited satisfactory organoleptic characteristics, including a smooth texture, uniform appearance, and acceptable odor. No signs of phase separation or grittiness were observed, indicating good physical stability of the formulation.

The pH of the gel was found to be within the acceptable range for topical application, suggesting compatibility with the skin and minimizing the possibility of irritation. The viscosity and spreadability results demonstrated that the gel possessed suitable consistency and could be easily applied over the skin surface.

The formulation showed good homogeneity, indicating uniform distribution of herbal constituents throughout the gel matrix. Stability studies revealed no significant changes in color, odor, pH, or consistency during the storage period, confirming the stability of the developed formulation. Comparable stability behavior has been reported for herbal gel preparations containing Carbopol-based gel system .

VII. CONCLUSION

The present study successfully formulated and evaluated a polyherbal anti-inflammatory gel using selected herbal ingredients with known medicinal properties. The developed formulation exhibited satisfactory physicochemical characteristics, including appropriate pH, viscosity, spreadability, homogeneity, and appearance. The gel remained stable throughout the study period without significant changes in its physical properties.

The findings suggest that the formulated polyherbal gel has the potential to serve as an effective topical preparation for the management of inflammation. Overall, the study demonstrates that polyherbal gel formulations represent a promising and patient-friendly approach for topical antiinflammatory therapy. Further in-vivo and clinical studies are recommended to validate its safety, efficacy, and long-term therapeutic potential.

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