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Formulation and Evaluation of Polyherbal Analgesic Gel

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I. ABSTRACT

The formulation of a polyherbal analgesic gel was carried out to develop a herbal topical preparation intended for relief from joint and muscle pain as well as inflammation. The gel was designed for external application on painful areas such as the knees, elbows, wrists, ankles, shoulders, and fingers. Herbal ingredients including turmeric, ginger, mint, aloe vera, tulsi, clove, and eucalyptus oil were selected due to their analgesic, anti-inflammatory, soothing, and cooling properties. Turmeric helps in reducing pain and swelling, ginger supports inflammation control, mint provides a cooling sensation, aloe vera offers a soothing effect on the skin, while tulsi and clove contribute to pain and inflammation management.

The formulation was prepared using carbopol as a gelling agent to provide suitable texture and consistency for topical use. Glycerine was incorporated to improve moisture retention, spreadability, and smooth application of the gel. Additional components such as purified water, preservative, and pH-adjusting agents were included to improve formulation stability and maintain product quality.

The prepared polyherbal gel was evaluated using various physicochemical and performance parameters including appearance, colour, odour, pH, homogeneity, viscosity, spreadability, extrudability, washability, skin irritation, and stability. The results indicated that the formulation possessed good consistency, satisfactory homogeneity, easy spreadability, skin-friendly pH, and showed no significant irritation, suggesting its suitability as a herbal topical preparation for pain relief and inflammation management.

KEYWORDS: Polyherbal gel, Analgesic, Herbal formulation, Topical drug delivery, Natural extracts.

II. INTRODUCTION

Pain and inflammation are common health problems that affect people of all age groups and may occur due to injury, arthritis, muscular strain, joint disorders, or other medical conditions. Analgesic preparations are widely used to reduce pain and improve comfort. Topical drug delivery systems such as gels are commonly preferred because they provide local action at the site of application, reduce systemic side effects, and are easy to apply. Herbal formulations have gained importance in recent years due to their natural origin, better patient acceptance, lower chances of adverse effects, and therapeutic benefits.

A polyherbal analgesic gel is a herbal topical preparation developed by combining different medicinal plants with pain-relieving and anti-inflammatory activities. The use of multiple herbs in a single formulation may produce a combined therapeutic effect and improve effectiveness in managing pain and inflammation. Such gels are mainly applied for relief from muscular pain, joint pain, swelling, stiffness, and inflammation in body parts such as knees, elbows, wrists, ankles, shoulders, and fingers.

The present formulation contains herbal ingredients including turmeric, ginger, mint, aloe vera, tulsi, clove, and eucalyptus oil due to their medicinal properties. Turmeric is known for its anti-inflammatory and analgesic action, while ginger helps in reducing inflammation and discomfort. Mint provides a cooling sensation that may help in temporary pain relief. Aloe vera is used for its soothing and skin-protective properties. Tulsi and clove contribute to reducing inflammation and discomfort, whereas eucalyptus oil is widely used for its cooling and pain-relieving effects.

The gel was prepared using carbopol as a gelling agent to provide suitable consistency and smooth texture for topical application. Glycerine was added to improve moisture retention and spreadability of the gel. Other supporting ingredients such as purified water, preservatives, and pH-adjusting agents were included to maintain formulation stability, safety, and product quality.

The prepared polyherbal analgesic gel was evaluated for different physicochemical and performance parameters including appearance, colour, odour, pH, homogeneity, viscosity, spreadability, extrudability, washability, skin irritation, and stability. These evaluation tests help to determine the quality, effectiveness, safety, and suitability of the formulation for topical application.

III. MATERIALS AND METHODS

A. MATERIALS

Different herbal ingredients and pharmaceutical excipients were used in the preparation of the polyherbal analgesic gel. The herbal components included turmeric extract (2 g), ginger extract (2 g), mint extract (2 g), tulsi extract (2 g), clove extract (1 g), aloe vera gel (10 g), and eucalyptus oil (1 mL). These ingredients were selected because of their potential analgesic, anti-inflammatory, soothing, and cooling activities. Carbopol 940 (1 g) was used to prepare the gel structure and provide appropriate thickness. Glycerine was incorporated to improve softness, moisture retention, and ease of spreading. Purified water served as the base medium for gel preparation, while suitable preservatives and pH modifiers were included to improve product stability and maintain skin compatibility.

IV . METHOD OF PREPARATION

Step 1: Preparation of Gel Base.

A measured quantity of distilled water (40 g) was transferred into a clean beaker. Carbopol 940 (1 g) was gradually added with constant stirring to prevent the formation of lumps. The dispersion was then kept undisturbed for approximately 30 minutes to allow complete hydration and swelling of the polymer.

Step 2: Preparation of Herbal Blend.

In a separate beaker, turmeric extract (2 g), ginger extract (2 g), mint extract (2 g), clove extract (1 g), tulsi extract (2 g), and aloe vera gel (10 g) were combined. To this mixture, glycerin (5 g) and propylene glycol (5 g) were added. The ingredients were mixed thoroughly using a glass rod or stirrer until a smooth and uniform mixture was obtained.

Step 3: Addition of Essential Oil.

Eucalyptus oil (1 mL) was incorporated into the prepared herbal mixture and stirred continuously for a few minutes to ensure even distribution throughout the formulation.

Step 4: Addition of Preservative.

Methyl paraben (0.2 g) was dissolved in warm distilled water (5 g) and added to the herbal mixture. The solution was mixed properly to achieve uniform blending.

Step 5: Incorporation into Gel Base.

The prepared herbal mixture was slowly added to the hydrated Carbopol base with continuous stirring. Mixing was continued until a homogeneous formulation was formed.

Step 6: Neutralization and Gel Formation.

Triethanolamine (0.8 g) was added gradually while stirring continuously to neutralize the formulation and promote gel formation. Stirring was continued until a smooth gel consistency was achieved, and the pH was adjusted to a suitable skin-friendly range.

Step 7: Final Adjustment of Volume.

The remaining amount of distilled water was added to make the final required quantity, followed by thorough mixing to obtain a uniform and lump-free gel preparation.

Step 8: Packaging and Storage.

The prepared gel was transferred into a clean, airtight container and stored at room temperature in a place protected from direct sunlight.

USES

- 1.Helps reduce mild muscle pain and body aches.
- 2.Provides relief from joint pain and stiffness.
- 3.Gives a cooling and soothing effect on the skin.
- 4.May help decrease minor inflammation and swelling.
- 5.Can be used for temporary relief from back pain or sprains.

V . RESULTS AND DISCUSSION

ORGANOLEPTIC PROPERTIES

Sr. no	Parameters	Observation
1	Appearance	Smooth and semi-solid gel
2	Colour	Greenish appearance
3	Odour	Mild characteristic herbal smell
4	Texture	Soft and uniform texture

TABLE :- 1

PHYSIOCHEMICAL EVALUATION TABLE

Sr. No.	Parameter	Observation
1	pH	5.5-6.5
2	Viscosity	Suitable viscosity for topical application
3	Homogeneity	Uniform preparation without lumps
4	Spreadability	Easily spreadable on skin
5	Washability	Easily removed with water
6	Extrudability	Smooth extrusion from container

TABLE :- 2

QUALITY CONTROL EVALUATION TABLE

Sr. No.	Parameter	Observation
1	Consistency	Uniform and smooth consistency

2	Skin irritation test	No visible irritation or redness observed
3	Ease of application	Easily applied on affected area
4	Product Uniformity	Proper mixing of ingredients observed

TABLE :- 3

VI .DISCUSSION

The prepared polyherbal analgesic gel exhibited a uniform appearance with smooth texture and acceptable consistency, making it suitable for topical use. The formulation showed good homogeneity and no visible signs of separation or instability during evaluation. The pH of the gel was maintained in a

skin-friendly range, indicating reduced chances of irritation after application. Viscosity and spreadability results suggested that the gel could be easily applied and evenly distributed on the affected area. Evaluation of quality parameters showed satisfactory performance of the formulation. Stability observations revealed no significant changes in physical characteristics such as color, odor, and texture during the study period, suggesting that the formulation remained stable under recommended storage conditions. Overall, the results indicate that the developed gel has potential for effective topical pain relief and comfortable application.

VII. CONCLUSION

The polyherbal analgesic gel was successfully prepared using natural ingredients such as turmeric, ginger, mint, aloe vera, clove, tulsi, and eucalyptus oil. The formulation showed satisfactory physical characteristics including smooth texture, good consistency, uniform mixing, and easy application on the skin. Evaluation parameters such as pH, spreadability, viscosity, washability, and extrudability were found to be suitable for topical use, indicating that the gel has acceptable quality and user-friendly properties.

The stability study suggested that the prepared gel remained stable during the observation period without major changes in appearance, odor, consistency, or pH. Based on the overall findings, the formulation may help in providing soothing, cooling, and mild pain-relieving effects for localized discomfort, muscle pain, and joint-related pain. The use of multiple herbal ingredients in a single

formulation may also improve its effectiveness and suitability for topical application.

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