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FORMULATION AND EVALUATION OF HERBAL PAIN RELIEF GEL FOR THE TREATMENT OF RHEUMATOID ARTHRITIS

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ABSTRACT

Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disorder characterized by joint pain, swelling, and stiffness. The present study aims to formulate and evaluate a herbal pain relief gel using natural ingredients such as Neem, Turmeric, Ginger, and Aloe vera, known for their anti-inflammatory and analgesic properties. The gel was prepared using Carbopol as a gelling agent and evaluated for physicochemical parameters such as pH, viscosity, spreadability, and stability. The results indicated that the formulation showed good consistency, stability, and therapeutic potential for topical application in rheumatoid arthritis management.

KEYWORDS: Herbal gel, Rheumatoid arthritis, Anti-inflammatory, Neem, Turmeric, Aloe vera.

1. INTRODUCTION

Rheumatoid arthritis (RA) is a long-term autoimmune disease that primarily affects joints, causing pain, inflammation, and reduced mobility. Conventional treatments such as NSAIDs and corticosteroids provide relief but are associated with side effects on long-term use.

Herbal medicines have gained attention due to their safety, effectiveness, and minimal side effects. Natural herbs like Neem (*Azadirachta indica*), Turmeric (*Curcuma longa*), Ginger (*Zingiber officinale*), and Aloe vera have proven anti-inflammatory, analgesic, and antioxidant activities.

Topical gels are preferred dosage forms because they are non-greasy, easily absorbable, and

provide localized action.

2. AIM AND OBJECTIVE

AIM

To formulate and evaluate a herbal pain relief gel for the treatment of rheumatoid arthritis.

OBJECTIVES

- To select suitable herbal ingredients with anti-inflammatory properties
- To prepare herbal extract
- To formulate gel using suitable base
- To evaluate the gel for physicochemical parameters

3. MATERIALS AND METHODS

3.1 MATERIALS

- Neem powder
- Turmeric powder
- Ginger powder
- Aloe vera gel
- Carbopol 940
- Triethanolamine
- Glycerin
- Peppermint Oil
- Methyl paraben
- Distilled water

3.2 Composition of pain relief gel

Table 1: Composition of pain relief gel.

S.no.	INGREDIENTS	Qty.F1	F2	F3	Role
1.	Turmeric	2ml	1.5ml	1ml	ant inflammatory
2.	Neem	1ml	1.5ml	2ml	Antibacterial
3.	Ginger	1.5ml	2ml	1.5ml	Analgesic
4.	Glycerin	1ml	1.5ml	2ml	Humectant
5.	Peppermint oil	0.5ml	0.15ml	0.10ml	Cooling effect
6.	Carbopol 940	0.5gm	1gm	1gm	Gel
7.	Distilled water	Q.S.	Q.S.	Q.S.	Vehicle
8.	Methyl Paraben	0.1gm	0.1gm	0.1gm	Preservatives
9.	Triethanolamine	Q.S.	Q.S.	Q.S.	PH adjuster

3.3 Preparation of Herbal Extract

- All herbal powders were taken in equal quantity
- Mixed with distilled water
- Heated for 30–45 minutes (decoction method)
- Filtered to obtain extract

fig.1 Herbal extract.

fig.2 Carbopol Gel.

3. Formulation of Gel

1. Carbopol 940 was dispersed in distilled water and allowed to swell
2. Herbal extract was added slowly with stirring
3. Glycerin was added as humectant
4. Preservative (methyl paraben) was added
5. pH adjusted using triethanolamine
6. Gel was mixed until homogeneous consistency obtained.

4. Evaluation Parameter

1. Physical Evaluation

The prepared cream formulations were evaluated for physical parameters such as color, Oduor, texture, and state. The observations were made visually to ensure uniformity and acceptable appearance.

2. Irritancy Test

A 1 cm^2 area was marked on the dorsal surface of the left hand. The cream was applied to the marked area, and the time of application was noted. The site was then observed for any signs

of irritation, erythema, or edema at regular intervals for up to 24 hours. The results were recorded accordingly.

3. Washability Test

The washability of the cream was evaluated by applying a small amount on the skin and washing it with tap water. All the formulations (F1, F2, F3) were found to be easily washable.

4. pH Test

The pH of the cream was determined using a digital pH meter. About 0.5 g of cream was dispersed in 50 ml of distilled water, and the pH was measured.

5. Phase Separation

The prepared cream was stored in a closed container, protected from light, at temperatures ranging from 25°C to 40°C. The formulation was observed for phase separation after 24 hours and over a period of 20 days. Any changes were noted.

6. Spread ability

Spread ability was determined by measuring the time required for two glass slides to slip apart when the cream was placed between them under a certain load. A shorter separation time indicates better spread ability. A small amount of cream was placed between two standard glass slides, and a weight was applied to form a uniform thin layer.

5. RESULT AND DISCUSSION

The herbal cream formulation contains medicinal plant extracts such as *Trida/ procumbens*, Aloe vera extract, mint extract, turmeric, and other ingredients known for enhancing skin glow and nourishment.

Various evaluation parameters including physical appearance, pH, irritancy, washability, spread ability, phase separation, and greasiness were assessed. All formulations showed satisfactory results in terms of stability, safety, and aesthetic properties.

The study indicates that incorporation of herbal ingredients resulted in a stable, effective, and cosmetically acceptable formulation with good skin feel and appearance.

5.1 Physical Evaluation

The prepared formulations were evaluated for color, odour, state, and consistency.

- The color of the cream was observed visually and found to be faint yellow.
- The Oduor was pleasant (lavender-like).
- The formulation was semi-solid in nature.
- The consistency was found to be smooth when applied to the skin.

Table 2: Evaluation test of F1, F2 and F3.

S.N.	Parameters	F1	F2	F3
1	Color	Faint yellow	Faint yellow	Faint yellow
2	Oduor	Pleasant	Pleasant	Pleasant
3	State	Semi-Solid	Semi -Solid	Semi-Solid
4	Consistency	Lightly smooth	Smooth	Smooth

5.2 Determination of pH

The pH of the formulated cream was determined using pH paper. A small quantity of the cream was taken and dispersed in distilled water, and the pH was measured. The pH values of all formulations were found to be within the range of neutral to slightly alkaline, which is suitable for topical application on the skin.

5. 2. Ph of Different Formulations

Table 3. Determination of Ph.

S.no.	Formulation	PH
1.	F1	Neutral
2.	F2	Neutral
3.	F3	Neutral

5.3. Phase Separation

The phase separation was not observed for any of the formulation. The results of phase Separation are listed in table no. 9.

Table 4: Phase Separation.

S.N.	Formulation	Phase Separation
1	F1	No Phase Separation
2	F2	No Phase Separation
3	F3	No Phase Separation

Fig. no.11 Spread ability.

fig. no.12 washability.

5.4 Spread ability

The Spread ability of the three formulations (C1, C2, and C3) was evaluated by measuring the time taken for two glass slides to separate under a specified load. It was observed that formulation C2 required the least time for the separation of the slides. As per the evaluation criteria, a lower separation time indicates better spread ability. Therefore, among all the formulations, C2 exhibited the best spread ability.

5.5. Irritability test: -After the application of the Herbal cream in all formulation, the irritability test shows No indication of Irritation. Results are listed in table 10.

Table 5: Irritancy Test.

S.N.	Formulation	Result
1	F1	Non irritant
2	F2	Non irritant
3	F3	Non irritant

5.6. Washability Test: -Formulation was applied on the skin and then ease extends of washing with water was Checked. Results are listed in table 11.

Table 6: Washability Test.

S.N.	Formulation	Result
1	F1	Easily washable
2	F2	Easily washable
3	F3	Easily washable

5.8 Physical Appearance

Color, odor, and consistency were observed.

5.9 pH

Measured using digital pH meter.

5.10 Viscosity

Determined using viscometer.

5.11 Spread ability

Checked by glass slide method.

5.12 Extrudability

Measured by tube pressing method.

5.13 Irritation Test

Applied on skin and observed for redness or irritation.

5.14 Stability Study

Stored at room temperature and observed for changes.

7. Uses of Herbal Gel

Herbal gels are widely used in pharmaceutical and cosmetic fields due to their non-greasy nature, ease of application, and better patient compliance. The major uses of herbal pain relief gel are as follows:

1. **Pain Relief**

Herbal gels are primarily used to relieve joint and muscle pain. In rheumatoid arthritis, they help reduce pain by providing a soothing and cooling effect.

2. **Anti-inflammatory Action**

The herbal ingredients such as Neem, Turmeric, and Ginger possess anti-inflammatory properties that help in reducing swelling and inflammation in affected joints.

3. **Topical Drug Delivery**

Gels are used as a topical dosage form for delivering drugs directly to the affected area, which enhances localized action and reduces systemic side effects.

4. **Muscle Relaxation**

Herbal gels help in relaxing stiff muscles and joints, improving mobility in patients suffering from arthritis.

5. **Improved Skin Absorption**

Due to their gel-based structure, they allow better absorption of active constituents through

the skin.

6. **Cooling and Soothing Effect**

Gels provide a cooling sensation upon application, which helps in relieving irritation and discomfort.

7. **Non-greasy and Easy to Use**

Unlike ointments, gels are non-sticky, easily washable, and more comfortable for regular use.

8. **Reduced Side Effects**

Herbal gels have fewer side effects compared to synthetic formulations, making them safer for long-term use.

8. RESULTS AND DISCUSSION

The prepared gel showed smooth texture, good spread ability, and acceptable pH (around 6–7). No skin irritation was observed. The formulation remained stable under normal conditions.

Herbal ingredients contributed to anti-inflammatory and analgesic activity, making the gel effective for rheumatoid arthritis relief.

There are three gels are formulated (**F1, F2, F3) and** second, third are best for efficacy and quality of a product.

9. CONCLUSION

The herbal pain relief gel was successfully formulated and evaluated. The results suggest that the formulation is safe, stable, and effective for topical treatment of rheumatoid arthritis. It can be used as an alternative to synthetic formulations.

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