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"Formulation And Evaluation Of Polyherbal Anti-Inflammatory Gel"

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ABSTRACT:

The Polyherbal Anti-inflammatory gels are the topical medications that are used to reduce inflammation and pain by the use of natural herb extracts. These Polyherbal gel contains Solanum nigrum and Eucalyptus globulus as herbal APIs. It also includes some others formulation excipients such as Carbopol 934, PEG, Triethanolamine, Methyl paraben and Propyl paraben. The Polyherbal Anti-inflammatory gel was formulated by the extraction of Solanum nigrum and Eucalyptus globulus. The evaluation parameters such as Organoleptic test, Consistency, pH, Viscosity, Spreadability, Washability, Irritancy test and Anti-microbial test were carried out to ensure a better formulation of Polyherbal gel. Finally the evaluation tests passed out its result and the Polyherbal gel was suitable for the topical administration. The primary purpose of this Polyherbal gel is to provide an Anti-inflammatory effect and reduce pain.

Keywords: *Solanum nigrum, Eucalyptus globulus,* Anti-inflammatory, Pain relief

1. INTRODUCTION

1.1TRANSDERMAL DRUG DELIVERY SYSTEM

Our skin is a largest organ on our body made up of different component including Water, protein, lipid, and minerals. Throughout our life, our skin will change constantly, for better or worse. Our skin regenerate itself approximately every 27 Days. So proper skin care is essential to maintain healthy skin.

There are four layers of skin:

1. Stratum corneum
2. Epidermis
3. Dermis
4. Subcutaneous

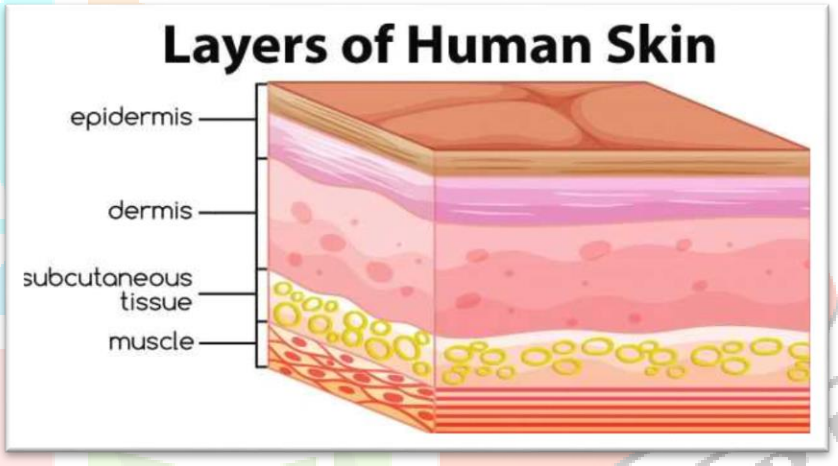

Fig 1: Layers of Skin

Skin is classified according to several factor related to its balance: sebaceous
Secretion, hydration and sensitivity level. Thus, each type of skin will have its Own characteristics and require different cares.
Based on characteristic there are five types of healthy skin:

1. Normal Skin
2. Dry Skin
3. Oily Skin
4. Combination skin
5. Sensitive skin

1.2 Anti-inflammatory gel:

Anti-inflammatory gels are topical medications designed to reduce pain and inflammation by inhibiting the production of chemicals that cause these symptoms. They are typically used for conditions like arthritis, muscle aches, and sprains, and are often preferred to oral NSAIDs due to potentially lower risk of gastrointestinal side effects.

TYPES OF INFLAMMATION:

1. Acute Inflammation:

This is a short-lived, rapid response to injury or infection.

- It typically resolves within a few hours to days.
- Examples include a minor cut that heals quickly, or a cold that Clear up after a few days.

2. Chronic Inflammation:

- This is a prolonged, persistent inflammatory response that can last for months or even years.
- It can occur when the body is unable to resolve the initial cause of inflammation or when the immune system mistakenly attacks Healthy tissues.
- Chronic inflammation is implicated in many chronic diseases, Including heart disease, diabetes, cancer, and arthritis.

Causes: Causes of inflammation are apparently causes of Diseases such as:

1. Physical Agents- Mechanical injury, Alteration in temperature and pressure, radiation injury.
2. Chemical Agents- Including the increasing list of drugs and Toxins.
3. Biological Agents (Infectious) - Bacteria, Virus, Fungi, Parasites.
4. Immunologic Disorder- Hypersensitivity reaction, Autoimmunity, Immunodeficiency states etc.
5. Genetic/Metabolic disorders- Examples gout, diabetes mellitus Etc…

2. PLANT PROFILE:

2.1 Solanum nigrum:

Fig 2: *Solanum nigrum*

Solanum nigrum, commonly known as black nightshade, is used in traditional Medicine for its anti-inflammatory properties. Extracts and components from the Plant have shown to reduce inflammation in various conditions. Its use in Traditional medicine for treating inflammation, gouty joints, and rheumatic pain supports its anti-inflammatory potential. Treating fever, opium poisoning, splenomegaly, liver diseases, rodent bites, Vitiligo, nausea, oral cavity diseases and headache. Curing skin diseases, burns, Itching and pain when applied externally. Acting as a diuretic, expectorant, Analgesic, sedative and diaphoretic. Balancing tridosha and cooling hot Inflammation.

2.2 *Eucalyptus globulus*:

Fig 3: *Eucalyptus globulus*

Eucalyptus glabrous is found to be a potential anti-microbial, anti-fungal, anti-Viral, anti-inflammatory, analgesic, anti-nociceptive and anti-oxidant agent of Nature. They are often used for treating coughs, colds,

and other respiratory Issues, as well as for wound care, insect repellent, and aromatherapy. Relieving Coughs and colds, Steam inhalation, treating respiratory Infections, dental health, Diabetes management, treat dry skin, promote relaxation.

2.3. Carbopol-934:

Fig 4: Carbopol 934

Carbopol 934 is a polymer frequently used in gel formulations to create a Gelling agent and a viscosity modifier.

Gelling Agent: Carbopol 934 acts as a gelling agent, transforming a liquid into a Gel-like consistency.

2.4 PEG (Polyethylene Glycol):

Fig 5: PEG

PEG hydrogels can be used to deliver drugs and other biomolecules in a Controlled manner, as they can be designed to release the encapsulated Substance over time.

2.5 Triethylamine:

Fig 6: Triethylamine

Triethylamine (TEA) is often used in gels as a pH adjuster and emulsifier, helping to stabilize the formulation and ensure the gel's consistency and texture. TEA helps to balance the pH of the gel, which is crucial for its stability and Effectiveness.

2.6 Methyl paraben:

Fig 7: Methyl Paraben

Methylparaben is a synthetic preservative often used in gel-based cosmetic and Personal care products. It's a common ingredient used to extend the shelf life of These products by preventing microbial growth and maintaining their stability. Methyl paraben inhibits the growth of bacteria, and fungi, which can spoil Products and pose safety risks.

2.7 Propyl paraben:

Fig 8: Propyl Paraben

Propylparaben is primarily used as a preservative in gels, especially water-based formulations, to prevent bacterial and fungal growth. It extends the shelf life of products like shaving gels, shampoos, and personal lubricants by inhibiting the growth of microbes. It works by disrupting the metabolic processes of these microorganisms, preventing them from multiplying and causing spoilage.

3. METHOD OF FORMULATION:

3.1 Method of preparation of gel:

Extraction process of *Eucalyptus globulus* & *Solanum nigrum* were done

↓

After that gel base was prepared by taking Carbopol-934 1.5gm and was added in 20ml warm water and 5ml of tap water

↓

Then it was soaked for overnight

↓

Methyl paraben & Propyl paraben were dissolved in 5 ml of hot water as Per required quantity

↓

Polyethylene glycol was measured as given quantity and further mixed with solution of methyl paraben & propyl paraben

↓

Solution was mixed in the above solution then extracts of Solanum Nigrum and Eucalyptus globulus were added as per quantity mentioned.

3.2 FORMULATION OF GEL:

No.	INGREDIENTS	F1	F2	F3
1.	*Solanum nigrum* Extract (ml)	0.3	0.4	**0.5**
2.	*Eucalyptus globulus* oil (ml)	0.4	0.3	**0.3**
3.	Carbopol-934 (gm)	0.5	1	**1.5**
4.	Polyethylene Glycol (ml)	7	7.5	**7.5**
5.	Methyl Paraben (gm)	0.2	0.2	**0.2**
6.	Propyl Paraben(gm)	0.4	0.4	**0.4**
7.	Triethylamine (ml)	q. s	q. s	**q. s**

TABLE 2: FORMULATION OF GEL

3.3 FINAL FORMULATED PRODUCT

Fig.9 Formulated product

3.4 EVALUATION OF GEL

- **Physical Evaluation:**

In this test the gel was observed for color, odor, texture, etc.

- Color: Pale green
- Odor: Pleasant
- pH: 6.49

Fig 10: Ph meter

- **Viscosity Test:**

Viscosity of gel was done by using Brooke field viscometer at temperature of 25 °C at 20 RPM.

Fig 11: Viscometer

- **Spreadability test:**

The Spreadability was expressed in terms of time in seconds taken by two Slides to slip off from the gel, placed in between the slides, under certain Load lesser the time taken for separation of the two slides better the Spreadability. Two sets of glass slides of standard dimension were taken. Then one slide of suitable dimension was taken and the gel formulation Was placed on that slide. Then other slide was placed on the top of the Formulation. Then a weight or certain load was placed on the upper slide so that the gel Between the two slides was pressed uniformly to form a thin layer.

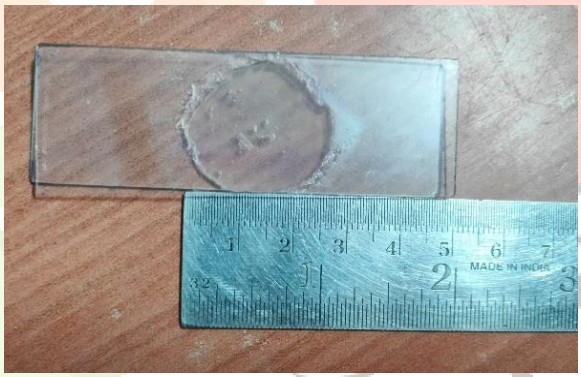

Fig 12: Spreadability test

- **Stability test:**

The purpose of stability testing is to provide evidence on how the quality of drug substance or drug product varies with time under the influence of Variety of environmental factors such as temperature, humidity and light and enables to recommend storage condition and to predict. The shelf life. Stability study for gel was performed at accelerated Condition i.e.25°C.

- **Skin irritation test:**

Mark the area (1 cm^2) on left hand dorsal surface. Then the gel was applied to that area and the time was noted. Then it is checked for irritancy, erythema, and edema if any for an interval Up to 24 h and reported.

- **Washability test:**

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

3.5 Evaluation Parameter of polyherbal anti-inflammatory gel

Sr no.	Parameters	Result
1.	Color	Pale green
2.	Odor	Pleasant
3.	Texture	Smooth
4.	State	Semi-solid
5.	pH	6.49
6.	Microbial test (Staphylococcus aureus)	Absent

4. RESULT & DISCUSSION

No.	PARAMETERS	F1	F2	F3
1.	Color	Light Green	Pale Green	Pale Green
2.	Odor	Pleasant	Pleasant	Pleasant
3.	Texture	Smooth	Smooth	Smooth
4.	State	Semi-solid	Semi-solid	Semi-solid
5.	pH	6.11	6.83	6.49

5. CONCLUSION:

- Although a variety of formulations are available in market for Anti-inflammation, still appear to be limited in pace of tissue Regeneration. Hence, we have made an attempt to formulate Polyherbal gel containing herbs as well as bioactive, which satisfy Almost all the mechanism of anti-inflammatory activity effectively.

- All the parameters remained unchanged throughout the stability Period for three formulations. The APIs selected showed good Anti-inflammatory activity. The study was an endeavor to Develop anti-inflammatory polyherbal formulations based on the Combination of herbal extract and bioactive constituents.

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