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Preparation and Evaluation of Anti-Inflammatory Topical Gel by Using Banyan Bark

Sravanthi Mulagada*, Sridivya Penki, Devi Podilapu, Gopi priya Pothala, Praveen Bandi

St.Ann's college of pharmacy, cantonment, vizianagaram, Andhra pradesh, India – 535003.

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ABSTRACT:
Anti-inflammatory topical gel was prepared using bark of banyan tree. Active ingredient banyan bark was used in this research work to relieves muscle pain, rheumatic pain, sometimes it also heals wound because of banyan bark contains rutin flavanoid. HPMC was used as a gelling agent. Diclofenac sodium, methyl salicylate, eucalyptus oil was used in the topical preparation. The gel has greatest anti-inflammatory properties of pain relieving and reduces inflammation. Topical anti-inflammatory banyan bark gel has good consistency, easily spreadable, good extrudability property, physically more stable due to low syneresis effect and optimum range of viscosity. No oily feeling on application to skin, is an advantage of this topical gel and easily permeable into skin layers.

KEY WORDS: Anti-inflammatory, Analgesic, Anti-rheumatic, Banyan bark.

I. INTRODUCTION

[1], [2].Drugs is applied topically to the skin, mainly for local action. Drugs applied to the skin for local effect include anti-septic, anti-fungal and anti-inflammatory agents. Delivering of drugs through the skin can be advantageous by avoiding first pass metabolism. Topical drug delivery treats a local disorder and aims to retain the active pharmaceutical ingredient within the skin. Skin is a complex multi-layered membrane but the outermost layer, the stratum corneum, provides the principal barrier to drug delivery. Inflammation is the body's initial response to injury and involves both cellular and vascular response. The release of histamine and no. of other cell mediated factors into the wound results in vasodilation, increased capillary permeation and stimulation of pain receptors.

[3].Topical anti-inflammatory products are available as gels, gel patches, sprays or foams. They contain an anti-inflammatory medicine such as ibuprofen, diclofenac, ketoprofen or piroxicam. When anti-inflammatory gel applied on the skin, it moves deeper into areas of the body where there is inflammation. They relieve pain and reduce swelling affecting joints and muscles when rubbed into the skin over the affect of area.

[4], [5], [6].Pharmaceutical topical gels are composed of drug in a suitable semi-solid base which is either hydrophilic or hydrophobic in character. The bases play an important role in determining the drug release character from the formulation. Gel is typically a semisolid, clear, and translucent and contain active substance. Gels are usually formed from a liquid phase that has been thickened with other components and may contain dissolved or dispersed drug in a semisolid system. The liquid in the gel essentially forms a continuous phase with the thickening agent enhancing viscosity by providing scaffold of a gel. Tragacanth, agar, sodium alginate, methyl cellulose, carboxy methyl cellulose, hydroxyl methyl cellulose, carbopol are used in the pharmaceutical gel forming polymers. Gel contain more amount of water because of that hydrates the stratum corneum and increase the permeability of stratum corneum leads to permeability to active substances. HPMC is semi synthetic polymer widely used as gelling agent in topical dosage formulations. It is clear, colourless, neutral, and non-toxic and produce gels with good viscosity. It is used as an emulsifying agent, suspending agent and stabilizing agent in topical preparations such as gels and ointments. It is freely dissolved in hot water. HPMC has good resistance to microbial attack & use of HPMC as a hydrophilic base also has advantages including producing good skin dispersion, cooling effect, not clogging skin pores, easy washing with water and good drug release.

[7], [8], [9].Ficus benghalensis is a scientific name of Banyan tree belongs to the family Moraceae. It is a large, every green, the leaves are greenish colour, bark is brown or grey

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and fruits are pinkish red in colour. Banyan tree also contains long aerial roots. It is a large and fast growing tree, more than 100 years is the life span of Banyan tree. Banyan tree is also called as The National Tree of India. Chemical constituents of bark have flavonoids, terpenoids, phenols, quinines, furano coumarin. Banyan bark has anti-inflammatory property, blood purifier, and anti-diabetic property. Because of the anti-inflammatory and anti-oxidant property of banyan bark, it is used in the wound healing and helps in reducing joint pains and inflammation associated with rheumatism. The bark extract of banyan could show anti-arthritic activity.

[10], [11], [12], [13].Diclofenac is non steroidal anti-inflammatory drug. It reduces the pain and inflammation caused by rheumatoid arthritis. Methyl salicylate (oil of wint green) is an organic compound. It is methyl ester of salicylic acid. It is a colourless, viscous liquid with a sweet, fruity odour. [14].Methyl salicylate is used in high concentrations as a rubefacient and analgesic to treat joint and muscular pain. Methyl salicylate is an external analgesic available in over the counter (OTC) medicine. When methyl salicylate absorbed into the skin, it helps to reduce pain in joints such as fingers, knee and elbows. Eucalyptus oil is a pale yellow colour liquid in appearance. Odour of eucalyptus oil is camphor acetous and aromatic. Eucalyptus oil has anti-inflammatory and anti-microbial properties. It helps to reduce inflammation and pain associated with osteoarthritis and rheumatoid arthritis. It helps in relieving back pain. [15].Methyl paraben is used as preservatives to give products a longer shelf-life and to prevent the growth of harmful bacteria. According to National Library of Medicine the ingredient occurs naturally in a handful of fruits like blueberries though it can also be created synthetically.

II. MATERIALS AND METHOD

Diclofenac sodium, methyl salicylate, HPMC K-15, methyl paraben was purchased from Yarrow chem products, Mumbai by St. Ann's college of pharmacy. Eucalyptus oil was purchased from local market of Vizianagaram. Banyan bark was collected from local area of the village, Gotlam.

FORMULATION OF ANTI-INFLAMMATORY TOPICAL BANYAN BARK GEL

Table no.1

INGREDIENTS	QUANTITY (gr)	PURPOSE
Banyan bark extract	92.07	Anti-inflammatory agent
Diclofenac sodium	1.04	Analgesic and anti-inflammatory agent
HPMC K-15	3.06	Gelling agent
Methyl salicylate	4.58	Rubefacient
Eucalyptus oil	2.37	Pain reliever
Methyl paraben	0.1	preservative

Preparation of Banyan Bark Extract

Collect fresh banyan barks from banyan tree and cut into small pieces, wash it with fresh water. Take a water bath put the barks into vessel and add water some water. Boil up to 20min to get dark brown concentrated bark extract. After boiling period filter the extract to remove the solid particles. Fill bark extract in a glass container and store it.

Preparation of Anti-Inflammatory Topical Banyan Bark Gel

Take a hot bark extract in a beaker gently add required quantity of HPMC K-15 mix little by little. Use Remi homogenizer mechanical stirrer for getting smooth and perfect gel mixture. Add one by one ingredient of methyl paraben, diclofenac sodium, methyl salicylate, eucalyptus oil stir well until all ingredients mix to get gel texture. The prepared gel was stored in a suitable container.

EVALUATION TEST

Physical characterization of gel

Colour, odour, texture, homogeneity, grittiness were observed visually and manually.

Test for P^H

Dissolve 0.5 gr of gel in a 15ml of distilled water. Kept it for 10min. Check P^H of gel by using P^H meter.

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Test for physical stability

1gr of gel is placed in a china dish heat up to 65˚c or above high temperature. Put melted gel on ice bath and cool it. Finally maintained gel in a refrigerator at 14ºc for a week.

Test for extrudability

Sufficient quantity of gel is filled in an empty clean aluminium tube close with the cap. The amount of gel filled in the tube is noted. Place the tube between two slides and tie with rubber bands. Weights are kept one by one on the upper slide. While weights are kept on slide, slowly remove the cap. The extruded gel weight, and weight of applied weights on tube is noted.

Test for spreadability

Take two slides place the weighed gel on it. Then keep another slide on gel. Gel is spread between the two slides. Hang the weights to upper slide one by one up to upper slide slightly sliding from gel. Note the weight of weights to be slide the upper slide from the gel, spreading diameter of the gel, and time taken to sliding upper slide.

Test for flavanoids

Required quantity of Banyan bark extract is taken add dilute NaOH solution drop by drop until extract getting colour change. After that add dilute HCl solution to colour changed bark extract drop by drop until bark extract solution becomes colourless.

Test for viscosity

Viscosity of gel is measured by using Brooke field viscometer at 30, 40, 50 rpm speed and select spindle number based on the product.

III. RESULTS AND DISCUSSION

Physical characteristics of anti-inflammatory topical banyan bark gel

Table no.2

Test	Observation
Colour	Reddish brown
Odour	Pleasant
Texture	Smooth and soft
Homogeneity	Good
Grittiness	No gritty particles

Evaluation test results of anti-inflammatory topical banyan bark gel

Table no.3

Test	Observation
P^H	7.73
Physical stability	No synerisis effect
Extrudability	Good (81%)
Spreadability	6cm/sec
Presence of Flavanoids	Changed coloured solution to colourless (Rutin was present)
Viscosity	12002.107 centipoise

IV. CONCLUSION

Anti-inflammatory topical gel was prepared by using natural anti-inflammatory agents of banyan bark, eucalyptus oil and other pharmaceutical active ingredient. Hydroxyl propyl methyl cellulose, a gelling agent used in gel preparation. Banyan bark gel appears as in reddish brown colour, smooth and soft texture with pleasant odour. Gel contains P^H-7.73, good extrudability and homogeneity character, spreadability property of gel was 6cm/sec, and rheological property of the gel was 12002.107 centi poise at 50 rpm with 63 number spindle. Flavanoids also present in gel was identified by colour change from dark brown to colourless on addition dilute HCl to dark brown colour bark extract i.e already treated with dilute NaOH. Finally the topical gel used for reducing pain & inflammation because the banyan bark has anti-inflammatory, analgesic, anti-rheumatic properties.

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BANYAN BARK ANTI-INFLAMMATORY TOPICAL GEL

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