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Research Article

FORMULATION AND EVALUATION OF HERBAL EMULGEL CONTAINING *SYZIGIUM CUMINI* EXTRACT

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ABSTRACT

Traditional healers use *Syzygium cumini* bark to treat inflammation. The main aim of this work is to formulate an emulgel containing extract of *Syzigium cumini*. *Syzygium cumini* bark was extracted using hydro-alcoholic solvent. Phytochemical evaluation of extract was done. In-vitro anti-inflammatory activity of the extract was evaluated. 4 batches of emulgel were formulated by varying the concentrations of the gelling agents. The emulgel was evaluated for pH, spreadability, viscosity, consistency, appearance, color, washability and appearance. Best results were shown by F2 formulation. Stability studies if F2 formulation was carried. The formulation was found to be stable. It was considered better for treatment of skin inflammation. The proposed research work concludes that the newly formulated herbal emulgel loaded with extract of *Syzygium cumini* can be used in future for anti-inflammatory effect.

INTRODUCTION

Herbal therapy is becoming more popular among the patients and the physicians.[1] Herbal medicines are commonly used to treat skin diseases. Indian folk medicines can treat a variety of diseases such as inflammation, leprosy, scabies, skin infections, ulcers and wounds. Indian System of Medicine have their roots in Ayurveda.[2] The potential of natural bioactive components is a major area of interest. There are various plant extracts that have curative benefits. The wide range of disorders can be treated using herbal medicines. The World Health Organization (WHO) reports that traditional and folk medicines are used by about 80% of people in the world.[3] Herbal medicines have wide range of benefits. Plant based drugs are inexpensive compared to modern synthetic medicines. Herbal medicines have good compatibility with the human body.[4]

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Inflammation can be cured by using plant and plant extracts. *Curcuma longa* Linn*, Zingiber officinalis* Roscoe*, Borago officinalis* Linn*, Oenothera biennis* Linn (Evening primrose), *Harpagophytum procumbens* (Devil's claw) and *Cedrus deodara* Roxb are traditionally reported anti-inflammatory plants.[5] *Syzygium cumini* bark is used to treat inflammation.[6] *Syzygium cumini* (family Myrtaceae) is an evergreen tropical tree that is found in Bangladesh, India, Nepal, Pakistan, and Indonesia. Jaam, Kalojaam, Jamun, Neredupandu, Jamblang, Jambolan, Black Plum, Plum, Dhat Plum, Jambolan Plum, Java Plum, or Portuguese Plum are some of its common names. It is used to treat dermopathies, constipation, leucorrhea, diuretics, diabetes, anthelmintic and carminative. *Syzygium cumini* shows antihyperglycemic, anti-inflammatory, antibacterial, cardioprotective and antioxidant properties. Traditionally it is used to treat inflammatory conditions.[7]

A topical drug delivery system is a targeted drug delivery method that involves application of drug directly to the part of the body. The cosmetic and dermatological preparations are formulated into topical dosage forms. The main benefits of topical delivery systems include avoiding first pass metabolism, avoiding the risks and drawbacks of

intravenous therapy, and avoiding changes that could affect absorption like pH changes, the presence of enzymes, and gastric emptying time.[8]

An emulsion is a topical drug delivery system that has emulsion incorporated into the gel. Oil-in-water (O/W) or water-in-oil (W/O) emulsions can be combined with a gelling agent to formulate the emulgel. These new formulations have been developed for topical drug administration and have shown to be effective at transporting hydrophobic medications. Emulgel functions as a dual-control drug release mechanism as a result of having traits of both a gel and an emulsion.[9] The purpose of the proposed research is to develop a herbal emulgel containing extract of *Syzygium cumini*.

MATERIALS AND METHOD

Collection and Authentication of plant materials:

The raw material *Syzygium cumini* bark was collected from Sindhudurg region. It was authenticated from Shri Pancham Khemraj Mahavidyalay, Sawantwadi. The samples were preserved in the Shri Pancham Khemraj Mahavidyalay Sawantwadi for further reference after authentication was done.

Drying and Grinding

After authentication *Syzygium cumini* was dried for 2 weeks. Then the bark was grinded to obtain a coarse powder. This powder was further used to obtain the extract.

Extraction of plant material

Hydro-alcoholic solvent was used to extract the powder. *Syzygium cumini* powder was macerated in 70% alcohol for a week. The powder was macerated for 1 week to obtain the extract. The marc was extracted with Soxhlet apparatus. Both the extracts obtained by maceration and Soxhlet apparatus were combined. This extracts was concentrated.

Preliminary Phytochemical Screening

Phytochemical screening is performed to identify presence of different Phytoconstituents. The extract was dissolved in ethanol. It was filtered and filtrate was used to carry out test for alkaloids, flavonoids, carbohydrates, saponins, tannins, steroids and terpenoids.

In-vitro anti-inflammatory activity

Human Red Blood Cell (HRBC) Membrane Stabilization Method: The Human Red Blood Cell (HRBC) membrane stabilization method was used to evaluate the anti-inflammatory activity of extract of *Syzigium cumini*. 2-3ml of blood was collected from healthy individual. The equal quantity of Alsever's solution was added to blood. Iso-saline was added to the above mixture. This mixture was centrifuge for 5 minute to get Human Red Blood Cell (HRBC) suspension. Equal amount of sample was added to HRBC suspension. 100, 200, 300µg/ml of concentration of sample were prepared. It was incubated at 37°C for 30 minutes. The mixtures were centrifuged for 5 minutes. Alsever's solution and blood were taken as negative control. Aspirin was taken as a standard. The supernatant solution obtained from centrifugation was used to carry out estimation using UV Spectroscopy at wavelength 560nm. [2,5]

Formulation of Emulgel

4 batches of emulgel were prepared by using different gelling agents and by varying their concentration. The emulsion was prepared by using 1% extract of *Syzygium cumini.* The gelling agents were soaked in water. Triethanolamine was added to adjust the pH of formulation to the pH of skin. The emulsion was added to the gel and stirred vigorously to form emulgel.[5]

Table 1: Herbal Emulgel Composition (%w/w)

Composition	F1	F2	F3	F4
Syzygium cumini extract	1	1	1	1
Carbopol-940	1	1.5	-	-
Sodium alginate	-	-	2	3
Propylene glycol	5	5	5	5
Ethanol	5	5	5	5
Methyl paraben	0.03	0.03	0.03	0.03
Propyl paraben	0.01	0.01	0.01	0.01
Mustard oil	7	7	-	-
Span 20	1	1	1	1
Tween 80	0.5	0.5	0.5	0.5
Triethanolamine	1.2	1.2	1.2	1.2
Water	qs	qs	qs	qs

Evaluation of Emulgel

The emulgel was evaluated for its physical characteristics, pH, spreadability and viscosity.

Physical Appearance

The physical appearance includes study of color, homogeneity, consistency, appearance, etc. Color was noted by visual observation. Homogeneity of emulgel was checked by rubbing the emulgel between fingers. The appearance of emulgel was checked by visual observation. Emulgel was applied to skin to check its consistency. [10,11]

pH

Using a digital pH meter, the pH of the batches was determined. 0.5gm of sample was dissolved in 10ml of distilled water. The electrode was dipped into the solution and pH was determined. [10,11]

Viscosity

A Brookfield viscometer was used to determine the viscosity of emulgel. A sample of 1gm was used. The speed of spindle was 50 rpm. Readings were obtained three times and the average of the three readings was calculated. [10,11]

Spreadability

Spreadability is indicative of the ease with which the formulation can be applied to the skin. 0.5gm of emulgel was weighed and placed on a petri plate. Other petri plate was placed on its top and weight of 50 grams was placed on the top of petri plate for about 5 mins. After completion of 5 mins the diameter of circles formed from the spread emulgel were measured in triplicate. The average of the reading was calculated.[12]

Stability studies

Stability testing was performed on the optimized batch. For one month, the gel formulations were tested for stability under accelerated conditions (40°C ± 2°C, 75% ± 5% RH) and room conditions (25°C ± 2°C, 60% ± 5% RH). The formulation was put in a container. Aluminum foil was used to cover the containers. At various time intervals, the gel formulation was evaluated for physical appearance, spreadability, pH and viscosity.[2]

RESULTS AND DISCUSSION

Table 2: Phytochemical Screening

S.No.	Active Constituents	Name of the Test	*Syzygium cumini* Extract
1.	Alkaloids	a.) Dragendorff's Test b.) Mayer's Test c.) Wagner's Test. d.) Hagger's Test	+ + + +
2.	Carbohydrates	a.) Molisch's Test b.) Fehlings's Test b.) Benedict's Test	+ + +
3.	Flavonoids	a.) Shinoda Test b.) Sulfuric acid test	+ +
4.	Tannin	a.) Lead acetate b.) 5% $Fecl_3$	+
5.	Steroids	a.) Salkowski Test	+
6.	Saponins	a.) Foam Test	+
7.	Terpenoids		+

Table 3: Anti-inflammatory activity of *Cedrus deodara* Extract (HRBC membrane stabilization method)

Concentration (µg/ml)	Absorbance	Prevention of lysis.
300	0.161	36.86
200	0.179	29.01
100	0.195	23.53
Standard	0.159	37.64
Negative control	0.255	

Figure 1: Anti-inflammatory activity of *Cedrus deodara* Extract (HRBC membrane stabilization method)

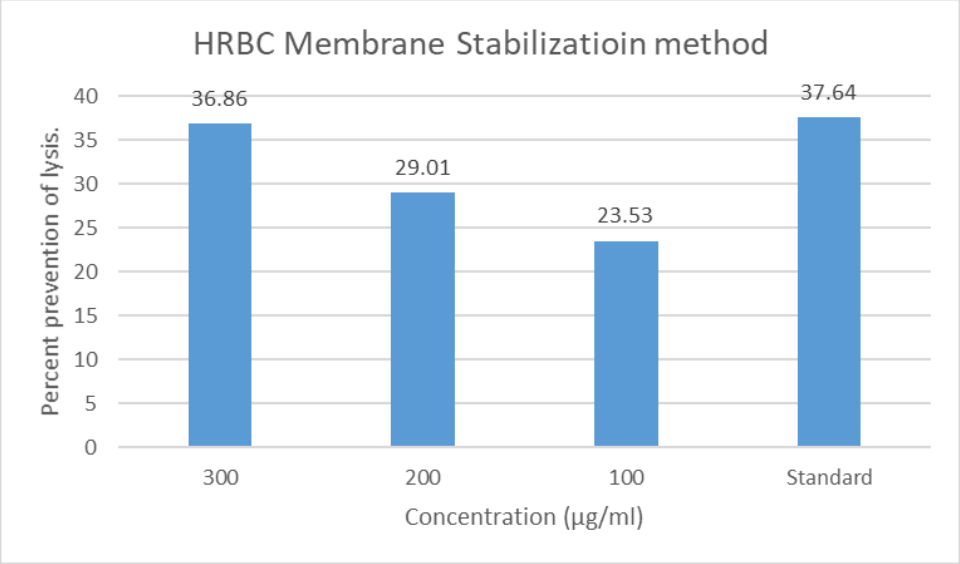

Table 4: Evaluation of Emulgel

	F1	F2	F3	F4
Colour	Beige	Beige	Beige	Beige
Consistency	Good	Very good	Good	Good
Homogeneity	Good	Good	Good	Good
Appearance	Semi-solid	Semi-solid	Semi-solid	Semi-solid
Greasiness	Non-greasy	Non-greasy	Non-greasy	Non-greasy
Washability	Washable	Washable	Washable	Washable
pH	6.43	6.45	6.47	6.46
Viscosity	2001	2099	1997	1982
Spreadability	6.0	5.8	6.9	6.1

The bark of *Syzygium cumini* was collected and authenticated. The drug was dried and grinded into coarse powder. The powder was macerated for 7 days using hydro-alcoholic solvent. The marc that was obtained was subjected to Soxhlet extraction. The extracts were combined and further concentrated. The extract obtained was used to study the phytochemical investigation. Phytochemical tests were performed to determine the presence of alkaloids, tannins, carbohydrate, flavonoids and terpenoids. *Syzygium cumini* showed presence of alkaloids, tannins, carbohydrates, flavonoids, and terpenoids. In-vitro anti-inflammatory activity of extract was accessed.

Emulsion was prepared using 1% *Syzigium cumini* extract. Emulgel was prepared using different gelling agents like Carbopol-949 and sodium CMC. The concentration of gelling agent was decided on basis of review of literature. 4 formulations of emulgel were formulated. The prepared batches were evaluated for its color, pH, greasiness, spreadability, viscosity and appearance.

The formulated batches had beige color. The formulations F1, F3 and F4 had good consistency whereas F2 had very good consistency. The natures of all batches were non-greasy. The washability of all the formulations was good. Viscosity of formulations ranged from 1982-2099. The pH of formulation ranged from 6.42-6.47. Spreadability of formulations was found in range of 5.8-6.9. HRBC membrane stabilization method was used to access anti-inflammatory activity. Best results were shown by F2 formulation. Stability studies were performed on batch F2 and it was found to be stable.

CONCLUSION

Natural remedies are more acceptable because they are safer with fewer side effects than the synthetic ones. Herbal formulations have growing demand in the world market. The hydro-alcoholic extract of *Syzigium cumini* showed good anti-inflammatory activity. 4 batches of emulgel were prepared by using 1% *Syzigium cumini* extract. F2 batch was found to be stable. It can be concluded that

the formulated emulgel can be used to treat topical inflammation.

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