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FORMULATION AND EVALUATION OF COSMETIC ACNE CREAM WITH GULMOHAR EXTRACT

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Abstract

The Gulmohar, commonly referred to as the Flame Tree, is esteemed not only for its breathtakingly vivid blossoms but also for its notable medicinal attributes. Hailing from the Leguminosae family, this botanical specimen has been employed in various herbal remedies for centuries. The Gulmohar is recognized for its multifaceted therapeutic properties, which encompass anti-diabetic, anti-bacterial, anti-diarrheal, hepatoprotective, cytotoxic, antimicrobial, and anti-inflammatory effects. Phytochemical investigations indicate that the plant is abundant in sterols, phenolic compounds, triterpenoids, and flavonoids. These bioactive constituents significantly contribute to its remarkable medicinal efficacy. Particularly, the mucilaginous tissue derived from the center of the Gulmohar leaf is harnessed in cosmetic medicinal formulations, especially for its pronounced anti-inflammatory properties. The comprehensive leaf extract contains tannins and a myriad of active constituents, which further augment its therapeutic potential. The extensive array of medicinal advantages offered by the Gulmohar emphasizes its significance in traditional medicine and accentuates its promise for contemporary medical applications.

Keywords: Gulmohar, Medicinal uses, Cosmetic Benefits, anti-inflammatory.

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Introduction

The term "cosmetic" is derived from the Greek phrase "kosm tikos," meaning the skill involved in decoration. The history of cosmetics traces humanity's evolution [1]. Prehistoric individuals, as far back as 3000 BC, used pigments for adornment and body coloration for protection against adversaries. Cosmetics were linked to hunting, combat, and religious practices, and later to medicine. Herbal cosmetics, referred to as "Products," are formulated using permissible ingredients, blending herbal constituents to provide specific benefits [2].

Herbal cosmetics offer numerous advantages, integrating natural components with skincare. Key benefits include:

Natural Ingredients

Plant-based constituents are milder on the skin, reducing irritation risk.

Nutrient-Rich

Herbs and plants are rich in vitamins, minerals, and antioxidants for healthy skin.

Environmentally Friendly

Typically sustainable, herbal cosmetics feature biodegradable packaging and eco-conscious production.

Less Chemical Exposure

Choosing herbal products minimizes exposure to harmful chemicals, benefiting those with sensitive skin.

Therapeutic Effects

Many herbal ingredients possess anti-inflammatory and healing properties, enhancing skin health.

Aromatherapy Benefits

Natural fragrances from herbs can promote relaxation.

Anti-Aging Properties

Herbal cosmetics often contain antioxidants that help reduce signs of aging.

Customizable

Herbal ingredients can be blended for personalized products tailored to skin types. Herbal cosmetics enhance beauty and contribute to skin health, making them a favored choice for natural skincare solutions [3, 4]. Herbal cosmetics enhance beauty and contribute to skin health, making them a favored choice for natural skincare solutions.

Skin and Its Functions

Tab 01: The multifunctionality of human skin [5, 6].

SKIN FUNCTIONS	DESCRIPTION	CELLS INVOLVED	COSMETIC PROBLEMS
Protection	Acts as a barrier against physical, chemical, and biological threats	Keratinocytes, Langerhans cells, Melanocytes	Acne, eczema, dermatitis, psoriasis
Sensation	Contains sensory receptors for touch, pain, temperature, and pressure	Merkel cells, Nerve endings	Numbness, hypersensitivity, contact dermatitis
Thermoregulation	Regulates body temperature through sweat and blood flow	Eccrine and Apocrine sweat glands, Blood vessels	Eccrine and Apocrine sweat glands, Blood vessels
Absorption	Absorbs certain substances, including medications and skincare products	Keratinocytes	Skin irritation, allergic reactions
Excretion	Eliminates toxins and waste products through sweat	Eccrine and Apocrine sweat glands	Body odor, clogged
Vitamin D Synthesis	Synthesizes vitamin D when exposed to sunlight	Keratinocytes	Vitamin D deficiency, hyperpigmentation
Defense	Protects against pathogens and infections	Langerhans cells, Keratinocytes	Skin infections, weakened immunity (e.g., cold sores)
Aesthetics and Social Communication	Contributes to appearance and non-verbal communication	Melanocytes, Fibroblasts	Wrinkles, fine lines, pigmentation issues, scarring

Gulmohar A Plant with Cosmetic and Therapeutic Uses, It enhances the efficacy of skincare formulations, being rich in sterols, phenolic compounds, triterpenoids, and flavonoids. These compounds are vital in skincare for their nourishing and protective properties [7].

Anti-Inflammatory Properties

The mucilaginous tissue is used in cosmetic products for its soothing effects, reducing redness and irritation.

Skin Nourishment: Extracts from Gulmohar leaves provide essential nutrients for a healthy complexion [8].

The Gulmohar Plant

Gulmohar is a deciduous tree with fern-like leaves, also known as the flame tree or royal poinciana (*Delonix regia*). It belongs to the family Fabaceae and is commonly found as a street tree in India, appreciated for its beauty. Mature trees develop broad, umbrella-shaped crowns and reach heights of 30 to 40 feet. Their leaves contain β -sitosterol, lupeol, and tannins. The plant is used for spasmogenic and antirheumatic applications, and its flowers serve as an acid-base indicator and natural dye.



Leaves [9]

Leaves are biparipinnate, slightly hairy, alternate, light green and 20-60 cm long. Leaflets are oblong, margins entire, opposite, stalk less, in 18 to 30 pairs, about 1.5 cm long. There are 2 compressed stipules at the base of the leafstalk that have long, comb like, narrow teeth. Gulmohar leaves contain a variety of phytochemicals that contribute to their medicinal and cosmetic benefits. Here are some of the key phytochemicals found in Gulmohar leaves:

Sterols [10]

These bioactive compounds play a pivotal role in preserving the skin's barrier function, mitigating moisture loss, and shielding the epidermis from environmental aggressors.

Phenolic Compounds [11]

Renowned for their potent antioxidant properties, phenolic compounds offer formidable protection against oxidative stress and curtail inflammation.

Triterpenoids [12]

These constituents exhibit remarkable anti-inflammatory and wound-healing attributes, rendering them advantageous for alleviating skin irritations and fostering recovery.

Flavonoids [13]

Flavonoids serve as antioxidants that safeguard the skin from environmental pollutants, diminish the visible signs of aging, and enhance dermal radiance.

2-Pentanone, 4-hydroxy-4-methyl-: This compound was recognized as a predominant component in acetone extracts of Gulmohar leaves.

Phytol [14]

Present in both acetone and n-hexane extracts, phytol

possesses moisturizing and protective characteristics beneficial for the skin.

Vitamin E [15]

Found in the acetone extracts, Vitamin E is celebrated for its antioxidant and skin-nourishing virtues.

Nonacosane [16]

This compound was detected in the n-hexane extracts and contributes to the overall bioactive profile of the plant.

Lupeol [17]

Identified in the n-hexane extracts, lupeol is characterized by its anti-inflammatory and skin-protective properties.

1, 30-triacontanediol: Another compound isolated from the n-hexane extracts, it adds to the plant's bioactive repertoire [18-20].

These phytochemicals collaboratively enhance the cosmetic advantages of Gulmohar leaves, establishing them as invaluable constituents in skincare formulations. According to a comprehensive literature survey, these benefits are attributed to the leaves of the Gulmohar plant, which encourages the development of a cream [21].

Material and Methods

Tab 02: The formulation process

STEPS	DESCRIPTION
Plant materials	The leaves of Gulmohar (5kg) was collected from our campus, Palamuru University and authenticated by Botany department, Palamuru University. Leaves are washed and dried under shade, after effective drying they are grounded coarsely.
Preparation of Extract	Coarsely powdered leaves of Gulmohar is placed in a container, the solvent is poured on top until completely covered the drug material by using hydro-ethanol in 1:2 ratio. The container is then closed and kept for three days. Filtered the extract and used for further process.
Phytochemical analysis	The extract was analysed for different phytochemicals by using standard methods.

Cream Formulation [22]

- Sodium Lauryl Sulphate (SLS): Acts as an emulsifying agent, helping to mix oil and water-based ingredients. It also functions as a surfactant, providing a rich lather and aiding in cleansing
- Glycerin: A humectant that attracts moisture from the air and deeper layers of the skin, helping to keep the skin hydrated and smooth
- Potassium Cetyl Phosphate: Functions as an emulsifier and thickening agent, helping to stabilize the cream and improve its texture

- **Liquid Paraffin:** Acts as an occlusive agent, forming a barrier on the skin to prevent moisture loss and keep the skin hydrated
- **Methyl Paraben:** A preservative that helps to prevent the growth of bacteria and fungi, extending the shelf life of the cream
- **Benzoic Acid:** Another preservative that inhibits the growth of yeast, mold, and bacteria, ensuring the cream remains safe for use
- **Sorbital:** Often used as a humectant and emulsifier, it helps to retain moisture in the skin and improve the texture of the cream
- **Distilled Water:** Serves as a solvent, diluting the active ingredients and helping to create a smooth, easily spreadable cream
- **Method of Preparation:** Sodium lauryl sulphate, potassium cetyl phosphate was taken in first beaker. Then heat on a water bath for uniform mixing. After a few minutes oil phase was formed. Hydroalcoholic leaf extract, Distilled water, liquid paraffin glycerine, sorbital, methyl paraben, benzoic acid, were taken in second beaker. Mixing all the ingredients by heating on a water bath, the aqueous phase was formed. Oil phase was added into aqueous phase and continuous stirring was to be done until semisolid mass was formed.

Cream Formulation Table

Tab 03: The cream formulation

S.NO	INGREDIENTS	F1	F2	F3
1.	Gulmohar extract	5gr	5gr	5gr
2.	Sodium lauryl sulphate	2.5gr	3gr	3.5gr
3.	Glycerin	4gr	4gr	4.0gr
4.	Potassium cetyl phosphate	0.7gr	0.8gr	0.9gr
5.	Liquid paraffin	4gr	4.5gr	5.0gr
6.	Methyl paraben	0.4gr	0.4gr	0.4gr
7.	Benzoic acid	0.1gr	0.1gr	0.1gr
8.	sorbital	14.5gr	15gr	15.5gr
9	Distilled water	Q.s	Q.s	Q.s

Evaluation of Cream

- Formulated herbal creams were evaluated for color, odor, consistency, and state.
- Color, odor, and state were observed visually.
- Consistency was checked by rubbing the cream on hand.
- pH was measured using a digital pH meter.
- Spreadability was measured by compressing the cream sample between two slides.
- Washability and non-irritancy were tested.
- Viscosity was measured using a Brooke field viscometer.
- Phase separation was observed after 24 hours.
- After feel was checked for emolliency.

Results

The prepared extract has shown positive result for phytochemicals like tannins, falvonoids, phenolics, carbohydrates, proteins.

Preformulation of Crude Powder drug

Tab 04: Preformulation of Crude Powder drug

S. NO.	PARAMETERS	OBSERVATION
1.	Colour	Dark Green
2.	Odour	Intense
3.	Taste	Bitter
4.	Moisture Content	0.42
5.	Loss on drying	9.5
6.	Ash Value	11.02%
7.	Acid insoluble value	2.0
8.	Water soluble value	4.5

Preliminary Qualitative Phytochemical Screening of Hydro Alcoholic Extract

Tab 05: Preliminary Qualitative Phytochemical Screening of Hydro Alcoholic Extract [21, 23]

SR. NO.	QUALITATIVE TESTS FOR	TEST REAGENT	PROCEDURE	END POINT	OBSERVATION
1.	Alkaloids	Hager's Test Wagner's Test Mayer's Test	2-3 ml filtrate +H. R. 2-3 ml filtrate + W. R. 2-3 ml filtrate +M. R.	Yellow ppt Reddish brown ppt Gives ppt	+ ++ ++
2.	Tannins & Phenolic Compounds	Ferric chloride test Lead acetate test Acetic Acid test Iodine sol ⁿ test Nitric acid test	2-3ml filtrate +5% FeCl ₃ 2-3ml filtrate + lead acetate sol ⁿ 2-3 ml filtrate + Acetic acid 2-3 ml filtrate +dil. Iodine sol ⁿ 2-3 ml filtrate +dil. HNO ₃	Deep blue black White ppt Red colour Transient Red Reddish to yellow	+++ +++ ++ +++ ++
3.	Flavonoids	Lead Acetate	Residue + lead acetate sol ⁿ	Yellow ppt	+++
4.	Saponin	Foam test	Drug extract + water (shaking)	Persistent foam observed.	+++

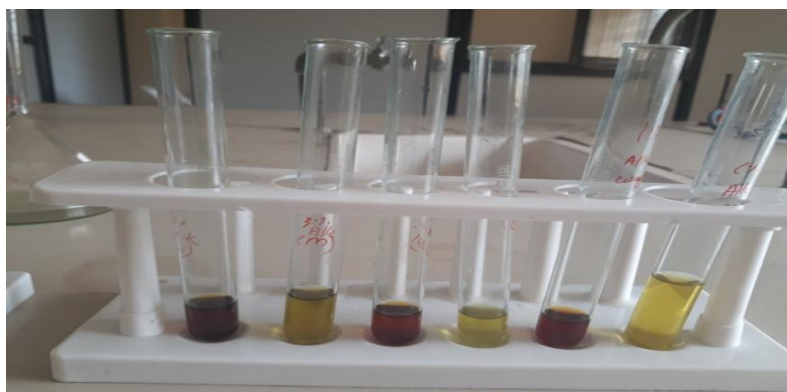


Fig 01: Evaluation Results

Evaluation Results

Tab 06: Evaluation Results

S.No	Parameter	F1	F2	F3
1.	Colour	Pale Green	Pale Green	Pale Green
2.	Odour	Characteristic	Characteristic	Characteristic
3.	State	Slight liquid	Solid	Semisolid
4.	Consistency	Smooth	Smooth	Smooth
5.	p ^H	7.5	7.2	6.5
6.	Spreadability	8.2gr/cm.sec	6.4gr/cm.sec	7.4 g/Cm.sec
7.	Washability	Easy washable	Easy washable	Easy Washable
8.	Non- Irritancy Test	Non-Irritant	Non-Irritant	Non-Irritant
9.	Viscosity	24345cps	20987cps	22080cps
10.	Phase Separation	No phase separation	No phase separation	No Phase Separation
11.	After Feel	Gritty	Emollient	Emollient

Discussion

The analysis shows that Gulmohar extracts can be effectively incorporated into various cosmetic formulations, providing multiple skin benefits. The presence of sterols, phenolic compounds, triterpenoids, and flavonoids contributes to the anti-inflammatory, antioxidant, and moisturizing properties of the products. The variations in viscosity, spreadability, and after-feel among the formulations offer diverse options for different skin types and preferences.

- All three formulations share similar visual and sensory properties, exhibiting a pale green color and characteristic odor.
- F1 has a slight liquid state, while F2 is solid, and F3 is semisolid, highlighting different textural consistencies.
- The pH levels of all formulations are within a neutral to slightly acidic range, ensuring skin compatibility.
- Spreadability varies among the formulations, with F1 showing the highest, making it easier to apply, while F2 demonstrates the least.
- All formulations are easily washable and have passed the non-irritancy test, confirming their suitability for regular use.
- Viscosity measurements indicate that F1 is the most viscous, followed by F3, with F2 being the least viscous.
- There is no phase separation observed in any of the formulations, ensuring stable emulsions.
- The after-feel differs, with F1 being slightly gritty and F2 and F3 providing an emollient sensation test results.

Conclusion

The study successfully demonstrates that Gulmohar extracts enhance the cosmetic properties of skincare formulations. The findings support the use of Gulmohar as a valuable ingredient in the development of natural and effective

cosmetic products. Future research could further explore the long-term benefits and potential applications of Gulmohar in skincare.

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Conflict of Interest

We declare no conflicts of interest.

Informed Consent

Not applicable.

Ethical Statement

This study did not involve human or animal participants.

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