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Formulation and evaluation of Anti Acne face serum

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Abstract

Acne vulgaris is a common skin disorder that affects millions of people worldwide, often causing physical illness and psychosocial problems. In recent years, the interest in natural skin care products has increased, which brought to light the investigation of potential anti-acne plant compounds Hibiscus (*Hibiscus rosa-sinensis*) extract as promising due to its rich phytochemical composition and traditional use in skin care. It was to formulate and find a suitable anti-acne facial serum. Five formulations were created, each including hibiscus extract and other plant extracts, such as green tea and rose extract, recognized for their antioxidant and anti-inflammatory capabilities. The serum solution was carefully examined in physiology, including appearance, texture, scent, and pH, to assure quality and acceptance. F5 was the top candidate in chemical analysis; It showed high efficacy and anti-acne properties while maintaining a light, non-sticky consistency that was perfect for all skin types. This study presents a novel study of the benefits of plant and hibiscus extracts for skin, offering a successful all-natural approach to acne treatment.

Keywords: Hibiscus, green tea, acne, rose, water extraction, pH, viscosity

Introduction

Acne affects over 85% of teenagers, making it one of the most common skin illnesses. Acne often develops in adolescence and fades by the age of 20, while some people suffer with acne into their 40s and 50s. It is generally dismissed as a self-limiting condition that is rarely life-threatening. It gets less attention in graduate and undergraduate schools. Despite its ostensibly cosmetic look, its effects can go well behind the skin's surface, causing patients to endure extreme emotional and psychological discomfort that may be considerably worse than the physical symptoms. Personal and functional issues at work, as well as suicidal ideas. According to estimates, the decline in quality of life is comparable to that caused by epilepsy, asthma, diabetes, or arthritis^[1].

Acne is assumed to be caused by four factors: excessive sebum production, aberrant keratinocyte proliferation and differentiation in the hair follicle, bacterial colonization, and a host inflammatory response. *Propionibacterium acnes*, a skin commensal, is hypothesized to generate an inflammatory reaction, resulting in subclinical and inflammatory acne lesions^[2].

Acne's clinical aspects are a collection of symptoms associated with enlarged, irritated, or damaged sebaceous units. The key characteristic is lesional polymorphism, which is more frequently observed on the chest, back, and face. The characteristic that appears most commonly is seborrhea. Pustules, papules, nodules, and cysts are examples of the inflammatory lesions that are seen in distended pilosebaceous units. These lesions can manifest as either closed or open comedones. In more extreme situations, a number of inflammatory papules and nodules combine to create draining sinuses, which can cause long-term scarring and, in rare instances, malignant alterations. Macular pigmentation and scars (hypertrophic, keloids, ice pick scars, depressed fibrotic and atrophic macules, perifollicular elastolysis) are indicative of post-inflammatory lesions, which can also happen. In skin that is pigmented, post-inflammatory hyperpigmentation is frequently observed^[1].

Topical retinoids like tretinoin and adapalene, as well as topical antibiotics like clindamycin and tetracycline, can help cure moderate acne. When topical combinations fail or are not tolerated, oral antibiotics are the standard course of treatment for moderate acne. First-line oral antibiotic therapy should include either first-generation tetracyclines (oxytetracycline and tetracycline hydrochloride) or second-generation tetracyclines (doxycycline, lymecycline, and minocycline)^[1].

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Patients with severe acne who do not react to topical and oral medications may benefit from oral isotretinoin treatment. Isotretinoin, a retinoid molecule, is associated with retinol (Vitamin A).

Long-term usage of oral macrolides for acne therapy promotes the development of macrolide-resistant *P. acnes* strains. In recent years, some countries have documented a rise in *P. acnes* resistance to clindamycin and macrolides. In some countries, *P. acnes* has evolved over 90% resistance to azithromycin and over 100% resistance to erythromycin. In a similar vein, *P. acnes* resistance to clindamycin increased from 4.4% in 1999 to 90.4% by 2016. A large proportion of acne patients (52%) carried at least one clindamycin-resistant *P. acnes* strain in their bodies. When acne was treated with topical clindamycin for 16 weeks, the number of resistant *P. acnes* increased by 16 times over the baseline.

Recurrent acne is an indication of resistant *P. acnes* strains, which can remain on the skin for an extended period of time after antibiotic medication is discontinued. Tolerable *P. acnes* strains can be observed on the skin for an extended period of time. Furthermore, the efficacy of these drugs is reduced or removed when patients are given antibiotics again [2].

Herbal remedies for acne therapy have been used since ancient times, and include diverse herbal extracts, oils, and ayurvedic formulations. The introduction of innovative herbal formulations for the treatment of acne may provide several advantages over previously utilized medicines. These herbal remedies are effective against a wide range of Gram-positive and Gram-negative bacteria. Sunder Vati, an ayurvedic preparation, has been shown to be orally efficient and well tolerated for the treatment of acne vulgaris. Purintablets and klarina cream formulations, which include various herbal extracts and have minimal side effects when compared to contemporary treatment, are often used to treat moderate to severe acne [3].

In recent times, plants are the rich source of drugs in traditional system of medicine, nutraceuticals, food supplements, modern medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. Plants have played a very important role in drug discovery. A majority of drugs being used in modern medicine have been obtained from medicinal plants. Large numbers of herbs are associated with anti-acne, anti-inflammatory, anti-bacterial and wound healing activity.

Herbal skincare and cosmetics have grown in popularity, with claims of efficacy and intrinsic acceptance due to their ease of use in everyday life and lack of the negative effects typically associated with synthetic goods. On the other hand, when compared to synthetic skincare and cosmetic chemicals, herbal products are gentle and biodegradable, with little toxicity. Natural plant molecules continue to be particularly fascinating for new studies, and a number of studies on medicinal plants are being conducted in many regions of the world in order to produce innovative herbal skincare and cosmetic products with fewer side effects and higher levels of beneficial component content [4].

The term "cosmetic" is derived from the Greek word "kosmetikos," which means having the ability to organize and decorate. Cosmetics' origins provide a continuous narrative throughout human history as they evolved. In prehistoric periods 3000 BC, man employed colors to lure the animals that he wanted to hunt, and he escaped hostile attacks by coloring his skin and adorning his body to instill fear in an adversary (whether man or animal). Cosmetics were originally connected with hunting, fighting, religion, and

superstition, before becoming related with medicine. Cosmeceuticals are cosmetics created with pharmaceutical-type components. The products referred to as cosmeceuticals include (i) beauty supplements like dietary supplements (capsules, tinctures); (ii) active cosmetics, which contain "active" ingredients; (iii) bioactive cosmetics, which contain "bioactive" ingredients; (iv) performance cosmetics; (v) Phyto cosmetics, which are made with natural ingredients from plants; (vi) functional cosmetics, which perform a function beyond the cosmetic; (vii) dermaceuticals; (viii) SkinCeuticals; (ix) cosm Herbs have long been utilized to preserve and improve human attractiveness due to their numerous functional benefits. Herbal products have been extensively investigated and evaluated for mildness, effectiveness, biodegradability, low toxicity, cleaning ability, emulsification, moisturization, skin look, feel, smell, and lubrication [6].

Face serum is a highly concentrated solution made from water or oil, much like any other cream. Serums, also known as concentrates, contain roughly ten times more biologically active ingredients than creams, allowing them to treat cosmetic issues more quickly and efficiently. Face serum has a high amount of active ingredients, which effectively address a variety of skin issues. They include a blend of active substances that not only target a specific skin ailment, but also address a variety of linked concerns. Serums are lighter skin-care formulas than moisturizers [7].

Hibiscus is well-known for its vivid blossoms and diverse phytochemical makeup, which contains anthocyanin, flavonoids, polyphenols, and organic acid, among others. These bioactive chemicals provide a variety of skincare advantages, including antioxidant, anti-inflammatory, antibacterial, and exfoliating capabilities, making hibiscus a desirable ingredient in skincare formulations, particularly those addressing acne.

The study aims to develop an anti-acne face serum supplemented with hibiscus extract and comprehensively test its physical properties. The purpose of creating a formulation that leverages the advantages of hibiscus and undertaking careful research is to guarantee that the serum satisfies the necessary requirements for efficacy, safety, and consumer appeal in resolving acne difficulties.

Materials and Methods

Materials

1. Hibiscus

- **Synonyms:** Red hibiscus, Chinese hibiscus, Gurhal, Semparutti, Rudrapuspa, Shoe flower plant [9, 10].
- **Biological Source:** *Hibiscus rosa-sinensis* Linn.
- **Family:** Malvaceae.

Chemical Constituents: Tannins, Flavonoids, Steroids, Alkaloids, Saponins, Total phenols, Total flavonoids, Total proanthocyanidin, Anthocyanins, riboflavin, ascorbic acid and thiamine.

Uses of Hibiscus

- The roots of *Hibiscus rosa-sinensis* Linn can be used as a cough suppressant.
- Leaves and flowers can be used as a hair growth promoter
- Leaves possess emollient properties, and it can be used in the treatment of Dysentery and Diarrhea.
- The flowers of *Hibiscus rosa-sinensis* can be used to control high blood pressure, stomach pain, and liver

diseases.

Benefits of hibiscus for skin

- It is used as an anti-acne agent
- It is used as an anti-ageing agent
- It is used in maintaining moisture of the skin
- It is used in treating uneven skin tone and hyperpigmentation.



Fig 1: Fresh flowers of hibiscus

2) Rose Water

- **Synonym:** Queen of flowers, Gift of angels, and Shatapatri ^[11, 12].
- **Biological Source:** *Rosa rubiginosa*.
- **Family:** Rosaceae.
- **Chemical Constituents:** polyphenols, tannins, flavonoids.
- **Source:** Purchased from local market.

Uses of Rose

- Anti-convulsant.
- Anti-inflammatory.
- Good for the digestive system.
- Relief from anxiety.

Benefits of rose for skin

- Soothing effect.
- Reduce skin inflammation.
- Preservative for cosmetic.
- Reduce skin redness.
- Reduce skin acne.
- Improve skin texture.

3) Green Tea

- **Synonym:** Chinese tea and Green tea extract ^[13, 14].
- **Biological Source:** *Camellia sinensis*
- **Family:** Theaceae
- **Chemical Constituents:** polyphenols, epicatechin, epigallocatechin, glutamic acid and theophylline.
- **Source:** dried green tea was purchased from Organic India

Uses of Green Tea

- Lowers cholesterol.
- Relief anxiety.
- Weight loss.

Benefits for skin

- Anti-oxidant.
- Protect skin from harmful UV radiation.
- Reduce skin inflammation.
- Soothing effect.



Fig 2: Green Tea

B. Methods

Extraction of Materials

Hibiscus

For hibiscus water extraction, 1.1-gram dried flowers were mixed with 100 ml of distilled water and heated for 10 minutes while stirring. Next, filter paper was used to separate the extraction ^[15].



Fig 3: Extraction process of hibiscus dried petals

Green Tea

Hot water extraction is a commonly used extraction method.

In this method, dried plant material are immersed in a boiling water bath at 80-100 °C for 10 minutes, and the liquid extract is collected by filtering through filter paper ^[16].



Fig 4: Extraction process of green tea

Formulation of anti-acne face serum

Five serum formulations were prepared, comprising the extract of hibiscus and green tea with different concentrations. The serum was prepared using Tween 80, glycerin, benzyl alcohol and the required amount of rose water in a sufficient quantity to prepare 100ml serum ^[15].

1. Pre-emulsification phase

Tween 80 and glycerin were thoroughly mixed in a beaker.

2. Prepare the water phase

Hibiscus extract, green tea extract and rose water were mixed well in another beaker.

3. Combining phases

4. The water phase was slowly added to the tween 80 and glycerin mixture with continuous stirring to ensure uniformity.

5. Add preservative

Benzyl alcohol in required quantity was added.

Ingredients	F1	F2	F3	F4	F5
Hibiscus	30	41	40	36	45
Rose water	24	18	23	32	31
Green tea	30	28	26	20	15
Glycerin	10	8	7	6	6
Tween 80	5	4	3	5	3
Benzyl alcohol	1	1	1	1	1



Fig 5: Red color face serum

Evaluation parameters of face serum

1) Physical evaluation

The formulation is evaluated based on visual appearance and touch. Color, grade, and other qualities are assessed based on their appearance.

2) pH

Using a standard buffer solution, a pH meter was calibrated. The pH of the combination was determined by accurately measuring and blending almost 1 mL of face serum with 10 mL of clean water. The skin has an acidic pH, and skin serums should have a pH between 4.1 to 6.7.

3) **Spread ability:** The serum spreads over the filter paper, indicating the area to which it was delivered. For each of the filter paper sizes selected, the total area (A1) and weight (W1)

are measured. Choose the test formulation and pour 5 mL of face serum into the middle of the filter paper. As soon as the final drip hits the filter paper, start a stopwatch or timer and count down until exactly 10 minutes have elapsed. During the 10-minute test, a largely constant circular pattern of liquid will cover the filter paper. Ten minutes later, cut precisely along the line between the saturated spreads. Also, dry the filter paper with scissors. Weigh the leftover dry filter paper (unsaturated). This weight should be referred to as W2. It is required to determine the diameter of saturated filter paper. If the spread does not form a full circle, take several diameter readings in the spread zone to get the average diameter. The correct entry for this measurement is A2 ^[18].

$$\% \text{ Spread by Area} = (A2/A1)100$$

4) Absorbance time

After applying the serum to the skin and timing how long it takes it to absorb, note the time.

5) Viscosity

Using a spindle type model S64, the viscosity of the formulation was measured at 100 rpm using a Brookfield

Characteristic	F1	F2	F3	F4	F5
Color	Red	Red	Red	Red	Red
Odour	Sweet smell	Sweet smell	Sweet smell	Sweet smell	Sweet smell
Homogeneity	Good	Good	Good	Good	Good
Texture	Smooth	Smooth	Smooth	Smooth	Smooth

2) pH

TEST	F1	F2	F3	F4	F5
pH	7.4	7.2	7	6.9	6.7

3) Spread ability

TEST	F1	F2	F3	F4	F5
Spreadability	5	7	9	12	15

4) Absorbance time

TEST	F1	F2	F3	F4	F5
Absorbance time	20	15	12	10	8

5) Viscosity

TEST	F1	F2	F3	F4	F5
Viscosity	800	650	450	300	150

Conclusion

After analyzing five formulations, we found F5 is the best choice for our anti-acne facial serum. F5 incorporates a blend of botanical goodness that can use hibiscus essence, known for its natural properties with carefully selected ingredients such as rose and green tea extract to soothe and fight acne. F5 offers an effective and balanced approach to treating acne to meet the unique needs of oily skin types -Emphasizes the potential of hibiscus as a solution, but also highlights how ingredients work together emphasizes importance, and makes treatment easier and more effective as we move forward and more commonly in acne treatment by building F5 plant-based skin improvement -It also promises a better future for skin health.

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viscometer. After dipping the spindle in 5 ml of the serum in a beaker for approximately 5 minutes, readings were obtained [17].

Result

1) Physical evaluation

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