

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Formulation and Evaluation of herbal face serum for Acne

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ABSTRACT

The increasing demand for herbal skincare products has driven the need for safe, effective, and naturally derived solutions for common skin problems such as acne. This study focuses on the formulation and evaluation of a herbal face serum using bioactive plant-based ingredients known for their antibacterial, anti-inflammatory, antioxidant, and skin-healing properties. The formulation incorporates Ratanjot roots, guava leaves, green tea leaves, tea tree oil, jojoba oil, lavender oil, aloe vera gel, vitamin E, salicylic acid, and Tween 20 as an emulsifying agent. Each component was selected based on its proven effectiveness in acne treatment and skin nourishment. The developed serum was evaluated for pH, spreadability, stability, and overall performance in managing acne-prone skin. The herbal serum aims to offer a chemical-free, side-effect-free, and sustainable alternative to synthetic commercial products, promoting both skin health and environmental safety.

KEYWORDS: Herbal Face Serum, Acne Treatment, Ratanjot, Guava Leaves, Tea Tree Oil, Aloe Vera, Natural Skincare, Anti-acne, Antioxidants, Essential Oils

INTRODUCTION

In recent years, there has been a significant shift in consumer preferences toward herbal and organic skincare products, driven by growing awareness about the side effects of synthetic chemicals and the desire for holistic skin health. Acne, being one of the most common dermatological concerns, especially among adolescents and young adults, often leads individuals to seek solutions that not only provide visible results but also nourish the skin gently without causing irritation or dryness. Conventional anti-acne products often contain harsh chemicals like benzoyl peroxide, which, while effective, can disrupt the skin's natural barrier and cause unwanted side effects. This has created a strong need for safer, more skin-compatible alternatives derived from natural sources.

The present study explores the development of an herbal face serum specifically designed for acne-prone skin using a carefully curated blend of potent natural ingredients. The formulation includes Ratanjot roots, known for their antimicrobial and soothing properties; guava leaves, rich in flavonoids and tannins that combat acne-causing bacteria; green tea leaves, packed with antioxidants that reduce inflammation; and tea tree oil, a widely recognized essential oil for its antibacterial and sebum-regulating effects. Jojoba oil mimics the skin's natural oils, providing hydration without clogging pores, while lavender oil offers calming, antibacterial, and anti-inflammatory benefits. Aloe vera gel, a cornerstone of natural skincare, is included for its hydrating and healing properties. Vitamin E acts as a powerful antioxidant that promotes skin repair, and salicylic acid, although a mild synthetic, is incorporated in minimal concentrations for its well-documented pore-cleansing and exfoliating action. To ensure the stability and consistency of the serum, Tween 20 is used as a natural emulsifying agent that helps blend the aqueous and oil phases without compromising the herbal integrity.

What sets this herbal serum apart from conventional products is its holistic formulation philosophy it avoids synthetic preservatives, artificial fragrances, and alcohol-based solvents, which are commonly present in market-available acne treatments. Moreover, the synergy between the herbal components enhances the therapeutic effectiveness of the serum without causing dryness or peeling, making it suitable for long-term use. This formulation stands as a multi-functional product that not only addresses acne but also improves overall skin texture, promotes healing of acne scars, and maintains moisture balance.

AIM OF THE PROJECT

Aims to develop a safe, effective, and eco-friendly face serum that caters to the modern consumer's need for gentle yet potent skincare. The formulation is not only a step toward green cosmetics but also a valuable contribution to the field of herbal pharmacology and dermato-cosmeceuticals.

MATERIAL AND METHODOLOGY

Extraction method of Ratanjot roots, Guava leaves & Green tea leaves

The extraction of active phytoconstituents from Ratanjot roots, guava leaves, and green tea leaves was carried out using the hot plate method, a simple and efficient technique ideal for herbal formulations. Initially, each plant material—Ratanjot roots, guava leaves, and green tea leaves—was thoroughly washed with distilled water to remove dust and impurities, followed by shade drying for several days to preserve the heat-sensitive bioactive compounds. Once completely dried, the materials were finely ground into coarse powders using a mechanical grinder. For each extract, 10 grams of powdered material was placed in a 250 mL beaker, to which 100 mL of distilled water was added as the extraction solvent. The beaker was then positioned on a hot plate, and the mixture was heated at a controlled temperature between $60-70^{\circ}$ C for approximately 30-45 minutes with continuous stirring to facilitate the release of phytochemicals into the solvent. Care was taken to prevent boiling, as excessive heat could degrade thermolabile components. After heating, the mixture was allowed to cool at room temperature and then filtered using muslin cloth followed by Whatman No. 1 filter paper to obtain a clear herbal extract. The filtrates were stored in amber-colored glass bottles under refrigeration (4°C) until further use in the serum formulation. This method ensured efficient extraction while maintaining the integrity of essential bioactive compounds crucial for anti-acne activity.



Figure 1: Ratanjot roots, Guava leaves & Green tea leaves Extract

FORMULATION OF HERBAL FACE SERUM FOR ACNE

The powdered forms of Ratanjot roots, guava leaves, and green tea leaves were subjected to aqueous extraction using the hot plate method, as previously described. Each extract was prepared separately, filtered, and stored in a cool, dark environment. In the formulation process, Tween 20 was used as a non-ionic emulsifying agent to blend the oil and aqueous phases. In a clean, sterile beaker, the aqueous extracts were combined and slightly warmed. Separately, the essential oil tea tree oil, jojoba oil, and lavender oil—along with vitamin E and salicylic acid were mixed to form the oil phase. Tween 20 was added gradually to this oil mixture to stabilize the emulsion. The oil phase was then slowly added to the aqueous phase with continuous stirring using a magnetic stirrer at moderate speed to ensure uniform mixing. Finally, fresh aloe vera gel was incorporated as a natural base to provide hydration and improve serum texture. The resulting serum was clear to slightly translucent, non-greasy, and smooth in consistency. The prepared formulation was transferred into sterilized amber-colored glass bottles and stored at room temperature for further evaluation.



Figure 2: Herbal face serum for glowing skin

Table 2: Formulation of herbal serum by using Herbal Extract and excipient

S. No.	Ingredient	Function	Quantity
1	Ratanjot Root Extract	Antibacterial, anti-inflammatory	5ml
2	Guava Leaf Extract	Antimicrobial, antioxidant	4ml
3	Green Tea Extract	Anti-inflammatory, antioxidant	4ml
4	Tea Tree Oil	Antibacterial, anti-acne	1-2 drops
5	Jojoba Oil	Moisturizer, sebum control	2-3 drps
6	Lavender Oil	Soothing, antibacterial	2 - 3 drops
7	Aloe Vera Gel	Base, hydrating, healing	9ml
8	Vitamin E	Antioxidant, skin repair	1 capsule
9	Salicylic Acid	Exfoliant, unclogs pores	0.5 ml
10	Tween 20	Emulsifying agent	1ml

EVALUTION

> pH Determination

The pH of the herbal face serum was measured using a calibrated digital pH meter by immersing the electrode directly into the formulation. The result was found to be within the range of 5.0 to 5.5, which aligns well with the natural pH of healthy facial skin. This mildly acidic pH helps maintain the skin's protective acid mantle, making the serum safe and non-irritating, especially for acne-prone and sensitive skin.

Skin Type Compatibility

To assess suitability for different skin types, the serum was tested on volunteers with dry, oily, and combination skin. Observations recorded over a one-week usage period showed that the serum effectively balanced oil on oily skin, provided moisture to dry skin, and adjusted well on combination skin without causing breakouts, irritation, or excessive dryness. Thus, the formulation is universally suitable.

> Viscosity Test

The viscosity of the serum was measured using a Brookfield viscometer at room temperature. The formulation exhibited moderate viscosity, indicating a non-runny, easily spreadable consistency. This ensures that the serum can be applied smoothly over the facial skin without any mess or dripping

> Organoleptic Properties

The serum was evaluated for its sensory attributes such as appearance, color, smell, and texture. It appeared as a semi-transparent pink-colored gel (due to Ratanjot), with a refreshing, mild herbal fragrance derived from tea tree and lavender oil. The texture was soft, non-greasy, and lightweight, which enhances user acceptability.

> Phase Separation Test

The stability of the formulation was tested by storing the serum under various environmental conditions including room temperature (25° C), refrigeration (4° C), and accelerated temperature (40° C) for a period of four weeks. No visible phase separation, curdling, or sedimentation was observed, indicating that the serum maintained excellent emulsion stability throughout the storage period.

Irritancy or Patch Test

A skin irritation test was conducted by applying a small amount of the serum on the forearm of 10 healthy volunteers. The area was observed for 24 hours for signs of redness, swelling, itching, or any allergic reaction. None of the participants reported any irritation, confirming that the serum is safe and dermatologically tolerable.

> Feel Test (Tactile Sensory Test)

A small amount of the serum was applied to the back of the hand and gently rubbed in to assess the feel on the skin. The serum was found to be silky, smooth, and non-sticky, leaving the skin hydrated with a soft, velvety finish. It did not clog pores or create a greasy layer, which is particularly beneficial for acne-prone skin.

> Drying and Absorption Time Test

The serum was tested for how quickly it dries and absorbs after application. It was observed that the formulation absorbed completely within 20– 30 seconds, without leaving any oily or sticky residue. This quick absorption rate makes the product ideal for both day and night use, even under makeup.

> Spreadability Test (Optional addition)

A fixed amount of serum was placed between two glass slides and a known weight was applied. The diameter of the spread was measured. The formulation demonstrated excellent spreadability, ensuring easy and even application over the face without excessive rubbing.

Stability Test (Accelerated Conditions)

The serum was subjected to stability testing at various temperatures (including 4°C, room temp, and 40°C) and different lighting conditions over a month. No changes in color, odor, or texture were observed. This indicates that the formulation is physically and chemically stable over time.

S. No.	Evaluation Parameter	Images	Observation / Result
1	pH Determination		pH found between 5.0 – 5.5; ideal for skin compatibility
2	Skin Type Compatibility		Suitable for all skin types, no irritation observed
3	Viscosity		Moderate viscosity, easy to apply and non-dripping

Table 2. Evaluation parameters

4	Organoleptic Properties	Light pink color, smooth texture, herbal fragrance, non-greasy
5	Phase Separation	No separation, stable emulsion after 4 weeks
6	Irritancy / Patch Test	No redness, swelling, or itching; non- irritant
7	Feel Test	Lightweight, smooth, non-sticky, pleasant to use
8	Drying/Absorption Time	Absorbed within 20–30 seconds, leaves no residue
9	Spreadability (optional)	Excellent spreadability, uniform application
10	Stability (Accelerated conditions)	No change in color, odor, or texture; formulation stable

RESULT & DISCUSSION

The formulated herbal face serum was evaluated on various physicochemical, organoleptic, and dermatological parameters, and the results indicate that the product is highly suitable for topical application, particularly for acne-prone skin. The pH of the formulation was found to be between 5.0 and 5.5, which aligns with the natural pH of human skin, minimizing the risk of irritation or dryness. This is particularly important for acne-affected skin, which can be sensitive and prone to disruption of the skin barrier. The viscosity of the serum was found to be moderate, allowing for easy application and even distribution without dripping or running. The organoleptic properties such as appearance, texture, and fragrance were pleasant and appealing to users. The light pink color, mild herbal scent, and non-sticky, smooth texture increased user acceptability. The phase separation test confirmed the stability of the serum over four weeks under different storage conditions. No signs of sedimentation or emulsion breakdown were observed, indicating good formulation stability. The patch test confirmed that the serum was non-irritating and safe, as none of the volunteers reported adverse reactions.

The feel test and absorption test further supported the cosmetic elegance of the formulation. The serum absorbed within 20–30 seconds, leaving a soft, hydrated, and matte finish, which is desirable for individuals with oily or acne-prone skin. The spreadability test also showed excellent results, allowing a small amount of product to cover a larger surface area efficiently. The results confirmed that the combination of herbal extracts and essential oils worked synergistically to create a safe, effective, and user-friendly serum. Active ingredients like tea tree oil, green tea, guava leaves, salicylic acid, and Ratanjot root extract contributed antibacterial, anti-inflammatory, and antioxidant benefits that directly target acne-causing bacteria and inflammation.

CONCLUSION

The present study successfully formulated and evaluated a herbal face serum enriched with plant-based extracts and essential oils for acne management. The formulation exhibited ideal physicochemical properties, high stability, and excellent skin compatibility. Key ingredients such as Ratanjot, guava leaves, green tea, tea tree oil, aloe vera gel, and salicylic acid were selected for their proven anti-acne and skin-repairing properties. The results of evaluation parameters confirmed that the serum is non-irritating, quick-absorbing, non-greasy, and cosmetically acceptable, making it a promising herbal alternative to synthetic acne treatments. This formulation stands out due to its natural composition, fewer side effects, and multifunctional benefits, offering a safe and effective solution for consumers seeking plant-based skincare. Further studies can be conducted to analyze its long-term efficacy and consumer satisfaction on a larger population scale.

REFERENCE:

- 1. Agarwal S, Sharma TR. Aloe vera and it's therapeutic efficacy asian journal of pharmacy and life science 2011; 1(2): 195-205
- 2. Urvashi N and bhardwaj R.I. aloe vera for human nutrition, health and cosmetic use international research journal of plant science 2012; 3(3): 38-48
- 3. M. Itdat zarnigar, Aloe vera a review of its clinical effectiveness, International research of journal of pharmacy, 2013: 4(8)
- 4. Sivaraman CM, saju F. Medicinal value of hibiscus rosasinensis; a review International journal of pharmacognosy 2016; 4(2)
- Janakiraman AK, Afroze S, et.al. (An Expedition Towards Formulating Natural Face Serum with Garcinia mangostana). Current Trends in Biotechnology and Pharmacy, 2023; 17(4): 61-63.
- 6. Kamble R, Gamare D, et.al. (Formulation and evaluation of herbal based anti-aging face serum). Foldscope & its Applications, 2022; 2: 127-130.
- 7. Sasidharan S, Joseph P. Junise. (Formulation and evaluation of fairness serum using polyherbalextracts). Int J Pharm, 2014; 4(3): 105.
- Thakre A D. (Formulation and development of de pigment serum incorporating fruits extract). International Journal of Innovative Science and Research Technology, 2017; 2(12): 330-82.
- Ojha S, Sinha S, et.al. (Formulation and evaluation of face serum containing bee venom and aloe vera gel). World Journal of Pharmaceutical Research, 2019; 8(7): 1100- 1103.
- 10. Aishwarya Gite. (Formulation and Development of Face Serum). International Journal of Creative Research Thoughts, 2023; 11(6): 833.