



# Formulation And Evaluation Of Herbal Antiacne Serum Using Hibiscus Rosa Sinesis

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## OBJECTIVE:

- 1) To prepare a herbal anti-acne serum using the extract of Hibiscus rosa-sinensis for topical application.
- 2) To evaluate the physicochemical properties of the formulated serum such as pH, viscosity, spreadability, and stability.
- 3) To study the antibacterial and anti-inflammatory potential of hibiscus extract for acne management.
- 4) To develop a safe and effective herbal formulation that may help reduce pimples and control excess oil production.
- 5) To assess the usefulness of plant-based ingredients in cosmetic and dermatological preparations.[1]

**KEYWORDS:**Anti-inflammatory activity, Antimicrobial activity, Flavonoids, Anthocyanins, Natural cosmetics, Skin care, Plant extracts

**ABSTRACT:**

Acne is a common skin problem caused by excess oil production, bacterial growth, and inflammation. Herbal formulations are increasingly preferred in skincare because they are natural and generally produce fewer side effects. The present study focuses on the preparation of a herbal anti-acne serum using *Hibiscus rosa-sinensis* extract. Hibiscus flowers contain bioactive compounds such as antioxidants and flavonoids that help reduce inflammation and control excess oil on the skin. The serum was formulated using ingredients like aloe vera gel, glycerin, propylene glycol, and Carbopol 940. The prepared formulation was evaluated for parameters such as pH, appearance, viscosity, spreadability, and stability. The results indicated that the serum had suitable properties for topical application and may be useful for managing acne and improving skin condition.[2]

**Introduction :**

Acne is one of the most common dermatological disorders affecting adolescents and young adults. It occurs due to blockage and inflammation of the pilosebaceous units of the skin, mainly caused by excess sebum production, accumulation of dead skin cells, bacterial growth, and hormonal imbalance. The bacterium *Propionibacterium acnes* (now known as *Cutibacterium acnes*) plays a significant role in the development of acne lesions. Conventional anti-acne treatments such as antibiotics, retinoids, and benzoyl peroxide are effective but may cause side effects like skin irritation, dryness, redness, and antibiotic resistance. Therefore, there is growing interest in herbal formulations as safer alternatives for acne management.

Herbal cosmetics are gaining popularity because they contain natural bioactive compounds that provide therapeutic benefits with minimal adverse effects. Many medicinal plants possess antimicrobial, anti-inflammatory, and antioxidant properties that help control acne and improve skin health. Among these plants, *Hibiscus rosa-sinensis* (family: Malvaceae) is widely used in traditional medicine and cosmetic preparations.[3]

*Hibiscus rosa-sinensis*, commonly known as Chinese hibiscus or shoe flower, contains several phytochemicals such as flavonoids, tannins, anthocyanins, and organic acids. These compounds exhibit antibacterial, antioxidant, and anti-inflammatory activities which are beneficial for treating acne and maintaining healthy skin. Extracts of hibiscus help reduce skin inflammation, control microbial growth, and promote skin rejuvenation. Serum formulations are widely used in modern skincare because they are lightweight, easily absorbed, and deliver active ingredients effectively into the skin. Herbal anti-acne serums prepared from natural plant extracts can provide targeted treatment while minimizing irritation associated with synthetic chemicals. Therefore, the present study focuses on the formulation and evaluation of a herbal anti-acne serum using *Hibiscus rosa-sinensis* to explore its potential as a safe and effective natural remedy for acne management . of a herbal anti-acne serum using *Hibiscus rosa-sinensis* to explore its potential as a safe and effective natural remedy for acne management .

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anti-acne serum using Hibiscus rosa-sinensis to explore its potential as a safe and effective natural remedy for acne management . of a herbal anti-acne serum using Hibiscus rosa-sinensis to explore its potential as a safe and effective natural remedy for acne management . [4]

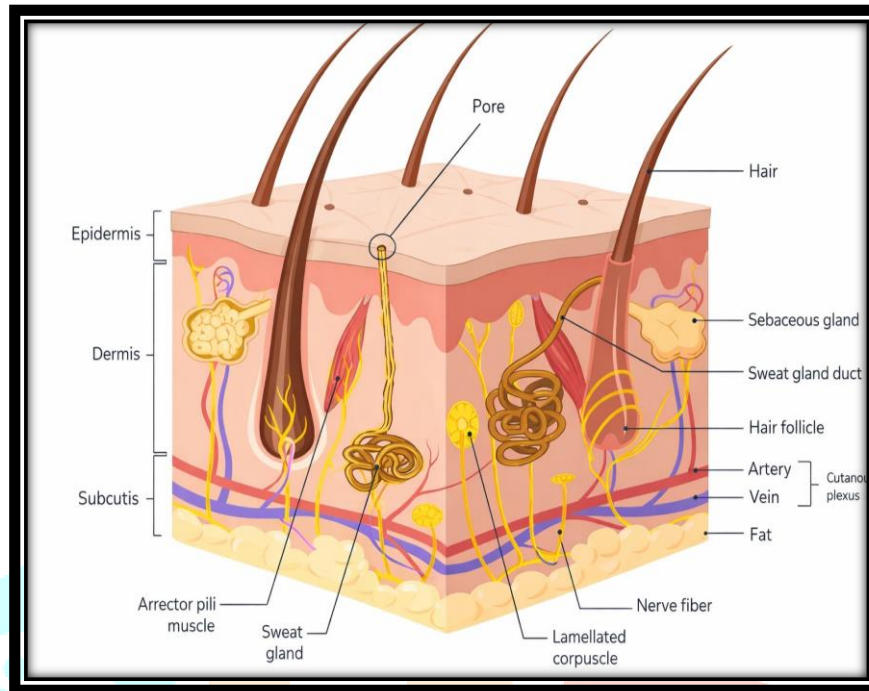


Fig No:1.1 Anatomy of Skin

**Cosmetic:** is defined under section 3 of the Drugs and Cosmetics Act, 1940 as, “any article intended to be rubbed, poured, sprinkled or sprayed on, or introduced , or otherwise applied to, the human body or any part thereof for cleansing. Beautifying. Promoting attractiveness, or altering the appearance, and includes any article intended for use as a component of cosmetic”.

### Anti Acne Serum:

An anti-acne serum is a lightweight skincare formulation designed to reduce acne, control excess oil, and improve skin health. Serums contain a high concentration of active ingredients and have a thin consistency, which allows them to penetrate deeper into the skin compared to creams or lotions. They are widely used in dermatology and cosmetic science for targeted treatment of skin problems such as acne, inflammation, and bacterial infections.

Acne develops when hair follicles become blocked with excess sebum, dead skin cells, and microorganisms. The bacterium *Cutibacterium acnes* (formerly *Propionibacterium acnes*) plays a major role in acne formation by causing inflammation and infection in the sebaceous glands. Anti-acne serums work by reducing microbial growth, controlling oil secretion, and soothing inflammation.

Herbal anti-acne serums are gaining popularity because they contain plant-based ingredients that have antimicrobial, antioxidant, and anti-inflammatory properties. These natural ingredients help treat acne with fewer side effects compared to synthetic chemicals. Plants such as *Hibiscus rosa-sinensis*, neem, aloe vera, and tea tree oil are commonly used in herbal cosmetic formulations.[5]

Hibiscus rosa-sinensis is especially useful in anti-acne formulations because it contains bioactive compounds such as flavonoids, anthocyanins, and organic acids. These compounds help reduce inflammation, inhibit bacterial growth, and promote skin healing. When incorporated into a serum formulation, hibiscus extract can help reduce acne lesions, improve skin texture, and support overall skin health.

Thus, herbal anti-acne serums formulated with medicinal plant extracts offer a natural and effective approach for managing acne while maintaining skin safety.[6]

### **Description of Antiacne Serum :**

A herbal anti-acne serum prepared from the extract of Hibiscus rosa-sinensis is used to help control acne and support healthy skin. The serum usually has a light texture and absorbs quickly into the skin, allowing the active components to act effectively on acne-affected areas. Hibiscus rosa-sinensis contains important phytochemicals such as flavonoids, tannins, anthocyanins, and organic acids, which possess antibacterial, antioxidant, and anti-inflammatory properties. These compounds help inhibit acne-causing microorganisms, reduce skin inflammation, and support the natural healing process. In this formulation, the hibiscus extract is mixed with suitable base ingredients like humectants, gelling agents, and preservatives to produce a stable serum. Regular use of this herbal preparation may help decrease pimples, control excess oil production, and improve overall skin appearance. Because it is based on natural plant ingredients, the formulation is generally considered gentle and safe for regular skincare use.[7]

### **Benefits of Herbal Antiacne Serum:**

1. **Antibacterial action:** Extract of Hibiscus rosa-sinensis helps inhibit the growth of acne-causing bacteria, which can reduce the formation of pimples.
2. **Anti-inflammatory effect:** The natural compounds present in hibiscus help soothe irritated skin and decrease redness and swelling associated with acne.
3. **Antioxidant properties:** Hibiscus contains antioxidants that protect the skin from damage caused by free radicals and support healthy skin cells.[8]
4. **Oil control:** The serum may help regulate excess sebum, which is one of the main causes of acne development.
5. **Skin healing:** Hibiscus extract can promote skin repair and help reduce marks left after acne.
6. **Improves skin texture:** Regular use may make the skin appear smoother, healthier, and more refreshed.
7. **Natural and gentle:** Being plant-based, hibiscus anti-acne serum is generally mild on the skin and suitable for regular use compared with many synthetic products.[9]

### Advantages of Antiacne Serum :

- Helps reduce pimples and prevents new breakouts.
- Controls excess oil on the skin.
- Penetrates deeply for better action.
- Unclogs pores and removes impurities.
- Soothes redness and inflammation.
- Fades acne marks and improves skin tone.
- Makes skin smooth and clear.

### Disadvantages:

- May cause skin irritation, redness, or burning sensation.
- Can lead to dryness and peeling of skin.
- Some ingredients may trigger allergies.
- Overuse can damage the skin barrier.[10]

### Plan Of Work :

Research Step		Illustration	
Research Step	Selection of Herbal Extract		
	Selection of Carbopol 940		
Research Step	Literature Survey of Herbal Anti Acne Serum		
	Physiochemical Properties		
Research Step	Evaluation of Herbal Anti Acne Serum		

Fig No : 1. 2 Plan OF Work

### Literature Survey:

1. **Kumar S., Patel R. [2019].**Herbal gel prepared using hibiscus extract showed good physicochemical stability and antibacterial activity against acne-causing bacteria.**Volume: 12(4) , Page No: 256-260.**

2. **Verma S., Singh R.[2020]**. Highlights importance of plant-based ingredients in acne treatment and cosmetic formulations. **Volume: 11(2)** , Page No:85-90
3. **Brown T., Smith J [2016]** . Discusses evaluation parameters like pH, viscosity, spreadibility & stability of cosmetic formulation , **Volume: 38(5)**, Page No: 456-462
4. **Ghosh A. & Ghosh T. [ 2018]** This review describes the phytochemical composition of Hibiscus rosa-sinensis, including flavonoids, tannins, and anthocyanins, and highlights its antioxidant, antibacterial, and anti-inflammatory activities. **Volume: 50 (1)** Page No : 50-56
5. **Ali, M., & Khan, N., [2018]** , The study evaluates Hibiscus rosa-sinensis extract for its anti-inflammatory and antibacterial activity, demonstrating its potential use in topical dermatological preparations. **Volume: 214 (1)** ,Page No.: 123–129.
6. **Bhowmik D., Chiranjib K.P., Sampath K.P., [2012]** The paper reviews the pharmacological properties of Hibiscus rosa-sinensis, including its antioxidant, anti-inflammatory, and antimicrobial activities useful in skin disorders.**Volume: 3(2)** ,Page No.: 534–538.
7. **Sharma N., Gupta M.,[ 2021]**The research focuses on the antibacterial activity of Hibiscus rosa-sinensis extract against acne-causing bacteria. The extract showed effective inhibition of Cutibacterium acnes.**Volume: 14(6)** ,Page No.: 120–125
8. **Gollnick HP, Finlay AY, Shear N [2003]** This article focuses on improving acne treatment strategies worldwide.It emphasizes combination therapy and regular skincare routines including the use of effective topical formulations like serums to enhance treatment results.
9. **Shalini K., [2024]** This study focuses on the development of a herbal face serum using Hibiscus rosa-sinensis extract due to its antioxidant and anti-inflammatory properties. The formulation was evaluated for physicochemical parameters such as pH, viscosity, and stability. FTIR analysis confirmed the presence of functional groups associated with flavonoids and phenolic compounds, indicating its potential effectiveness in skincare applications. **Volume: 8( 2)** Page No: 120–126
10. **Amtaghri S., Qabouche A., Slaoui M. [2024]**: This review summarizes the ethnobotanical significance, phytochemical composition, and pharmacological activities of Hibiscus rosa-sinensis. The plant is rich in flavonoids, anthocyanins, and phenolic compounds, contributing to its antioxidant, anti-inflammatory, and therapeutic potential.**Volume: 15(1)** ,Page No: 60–75

**Drug Profile:**❖ **Hibiscus rosa-sinensis Flowers**

- **Scientific Name:** Hibiscus rosa-sinensis
- **IUPAC Name:** 3,3',4',5,7-Pentahydroxyflavone (for the compound Quercetin present in hibiscus)
- **Colour:** Bright red
- **Odour:** Odourless or very faint odour
- **Chemical Constituents:** Quercetin , Anthocyanins, Flavonoids, Tannins, Phenolic compounds
- **Taste:** Sour and mucilaginous[11]
- **Storage:** Protect from light, moisture, and heat. Store in a well-closed container.
- **Solubility:** Soluble in water, ethanol, and hydro-alcoholic solvents.
- **pH:** 3.5 – 5.5
- **Density:** 0.95 – 1.05 g/cm<sup>3</sup>[[12]



Fig No 1.3 **Hibiscus rosa sinensis flower**

➤ **Excipient Profile:**❖ **Aloe vera gel:**

- **Scientific Name:** Aloe barbadensis Miller
- **Colour:** Grey to bright green (typically)
- **Odour:** Slightly bitter, fresh and herbaceous
- **Chemical Constituents:** Polysaccharides, Anthraquinones
- **Taste:** Bitter to slightly mucilaginous
- **Storage:** Use airtight, light-resistant containers to prevent degradation
- **Solubility:** Water – soluble; Oil – insoluble
- **pH:** 4.5 – 5.5
- **Density:** 1.03 – 1.05 g/mL[13]



Fig No: 1.4 Aloe vera gel

#### ❖ Carbopol 940 :

- **Chemical Name:** Carbomer 940
- **IUPAC Name:** Cross-linked polyacrylic acid polymer
- **Molecular Formula:**  $(C_3H_4O_2)_n$
- **Colour:** White, fluffy powder
- **Odour:** Odourless
- **Chemical Nature / Constituents:** Cross-linked polymer of acrylic acid (polyacrylic acid)
- **Taste:** Slightly acidic
- **Storage:** Store in tightly closed containers, protected from moisture and light
- **Solubility:** Swells and disperses in water; insoluble in most organic solvents
- **pH:** About 2.5 – 3.5 (before neutralization)
- **Density:**  $\sim 0.2 - 0.4 \text{ g/cm}^3$  (bulk density)[14]

#### ❖ Glycerine (Glycerol) :

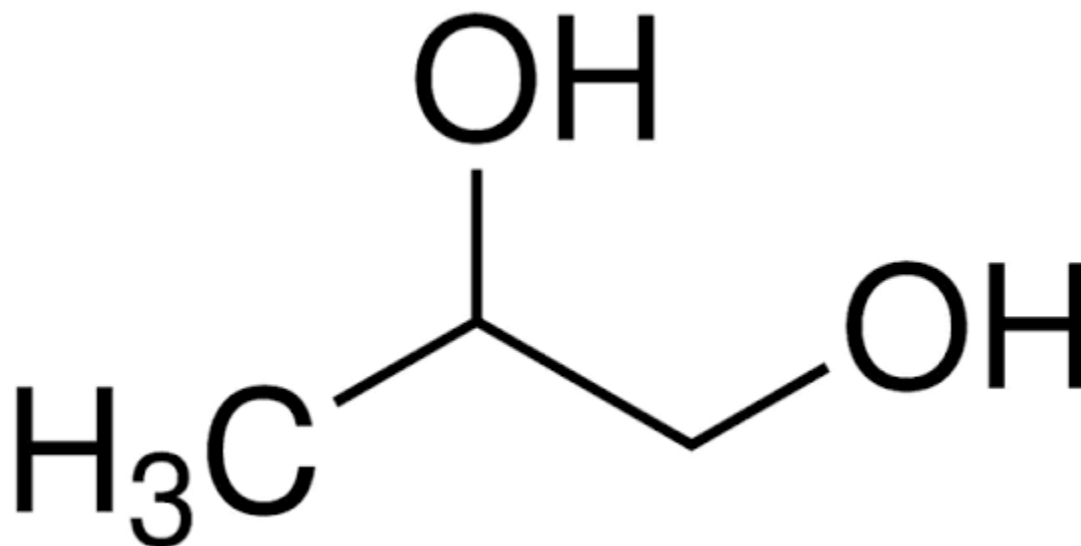
- **IUPAC Name:** Propane-1,2,3-triol
- **Molecular Formula:**  $C_3H_8O_3$
- **Colour:** Colourless, clear liquid
- **Odour:** Odourless
- **Chemical Nature / Constituents:** Trihydric alcohol (contains three –OH groups)
- **Taste:** Sweet taste
- **Storage:** Store in well-closed containers, protected from moisture and light
- **Solubility:** Completely soluble in water and alcohol; insoluble in oils
- **pH:** About 5.5 – 7
- **Density:**  $\sim 1.26 \text{ g/mL}$ [15]

#### ❖ Propylene Glycol :

- **IUPAC Name:** Propane-1,2-diol
- **Molecular Formula:**  $C_3H_8O_2$
- **Colour:** Colourless, clear liquid
- **Odour:** Odourless or slightly sweet odour
- **Chemical Nature / Constituents:** Dihydric alcohol (contains two –OH groups)
- **Taste:** Slightly sweet

- **Storage:** Store in tightly closed containers, protected from light and moisture
- **Solubility:** Completely soluble in water, alcohol, and acetone; miscible with many organic solvents
- **pH:** About 6 – 7
- **Density:** ~1.03 – 1.04 g/mL [16]

### Chemical Structure Of Propylene glycol:



#### ❖ Triethanolamine:

- **IUPAC Name:** 2,2',2''-Nitrilotriethanol
- **Molecular Formula:** C<sub>6</sub>H<sub>15</sub>NO<sub>3</sub>
- **Colour:** Colorless to pale yellow liquid
- **Odour:** Slight ammonia-like odour
- **Chemical Nature / Constituents:** Tertiary amine with three alcohol (–OH) groups
- **Taste:** Slightly bitter
- **Storage:** Store in tightly closed containers, protected from light and moisture
- **Solubility:** Soluble in water and alcohol; slightly soluble in ether
- **pH:** About 10–11 (alkaline)
- **Density:** ~1.12 g/mL[17]

#### ➤ Preservative:

#### ❖ Sodium Benzoate:

- **IUPAC Name:** Sodium benzenecarboxylate
- **Molecular Formula:** C<sub>7</sub>H<sub>5</sub>NaO<sub>2</sub>
- **Colour:** White crystalline powder or granules
- **Odour:** Odourless or faint benzoin odour
- **Chemical Nature / Constituents:** Sodium salt of benzoic acid
- **Taste:** Slightly sweet and astringent
- **Storage:** Store in well-closed containers, protected from moisture and light
- **Solubility:** Freely soluble in water; slightly soluble in alcohol
- **pH:** About 7 – 8 (aqueous solution)

- **Density:** ~1.44 g/cm<sup>3</sup>[18]
- **Colourant :**
- ❖ **Beet Root:**
  - **Scientific Name:** Beta vulgaris
  - **Family:** Amaranthaceae
  - **Colour:** Deep red or purple
  - **Odour:** Mild earthy odour
  - **Chemical Constituents:** (betalain pigments), sugars, vitamins, minerals
  - **Taste:** Sweet and earthy
  - **Storage:** Store in a cool and dry place, protected from light
  - **Solubility:** Pigments are soluble in water and alcohol
  - **pH:** About 4 – 6
  - **Density:** Not specifically defined (solid plant material)[19]



Fig No :1 .5 **Beetroot Extract**

### Materials & Functions :

**Table No :1-Materials & Their Function**

Serial No.	Ingredients	Functions
1	Hibiscus flower extract	Antiacne Agent
2	Aloe vera gel	Soothing & moisturizing Agent
3	Glycerine	Moisturizer
4	Propylene glycol	Humectant

5	Carbopol 940	Thickening agent
6	Triethanolamine	pH adjustment
7	Preservative (Sodium benzoate)	Stability
8	Distilled water	Base

## EXTRACTION METHODS :

### PREPARATION AND EXTRACTION OF HIBISCUS ROSA SINESIS :

Collection: Fresh hibiscus flowers are collected and washed with distilled water.

Drying: The flowers are shade-dried at room temperature.

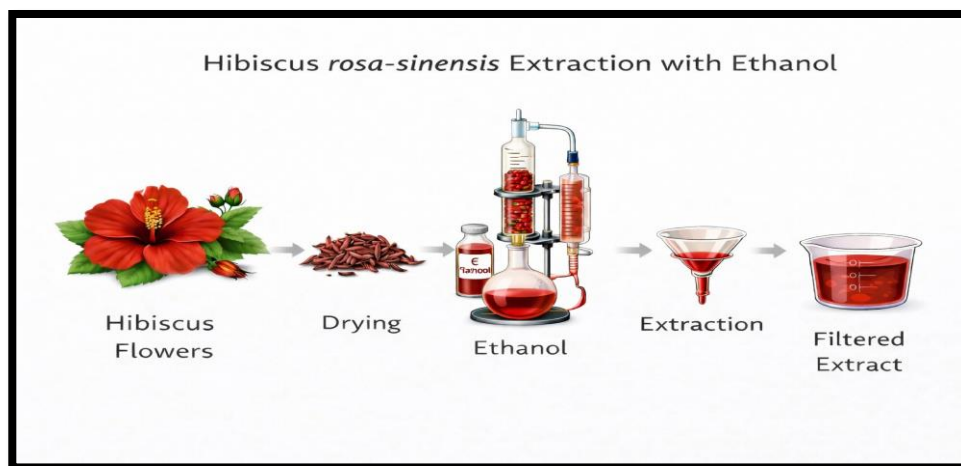
Grinding: Dried flowers are crushed to obtain a coarse powder.[21]

Extraction: The powder is mixed with a suitable solvent (distilled water or ethanol) in a conical flask and kept for extraction with occasional stirring.

Filtration: The mixture is filtered using filter paper to remove plant residues.

Concentration: The filtrate is gently heated on a water bath to obtain a concentrated extract.

Storage: The extract is stored in an airtight container for further formulation use.[22]



**Fig No : 1.6 Extraction Process**

### Ingredients , Chemical And Apparatus:

#### Ingredients:

**Table No: 2 -Ingredients & Quantity**

Serial No.	Ingredients	Quantity ( Required for 50 ml serum)
1	Hibiscus rosa sinesis extract	5 ml
2	Aloe vera gel	10 g
3	Glycerine	3 ml
4	Propylene glycol	2 ml
5	Carbopol 940	0.5 g
6	Triethanolamine	q.s
7	Distilled water	Upto 50 ml
8	Preservative ( Sodium Benzoate)	Few drops
9	Colourant ( Beet Root Extract)	0.5 g

**Chemicals & Apparatus:****Table No: 3 – Parameters , Chemical & Apparatus using Formulations**

Serial No.	Parameters	Chemical & Apparatus
1	Material for Decoction	<ul style="list-style-type: none"> <li>▪ Hibiscus rosa sinesis flower.</li> <li>▪ Ethanol / Distilled water</li> </ul>
2	Chemicals & Extract	<ul style="list-style-type: none"> <li>▪ Hibiscus rosa sinesis flower extract</li> <li>▪ Aloe vera gel</li> <li>▪ Glycerine</li> <li>▪ Propylene glycol</li> <li>▪ Carbopol 940</li> <li>▪ Triethanolamine</li> <li>▪ Preservative</li> <li>▪ Distilled water</li> </ul>
3	Apparatus	<ul style="list-style-type: none"> <li>▪ Beaker</li> <li>▪ Conical flask</li> <li>▪ Thermometer</li> <li>▪ Weighing Balance</li> <li>▪ Measuring cylinder</li> <li>▪ Whatman filter paper</li> </ul>

**Method Of Preparation:**

- **Step 1: Preparation of Hibiscus Extract**

Dried Hibiscus rosa-sinensis flowers are collected and ground into a fine powder. The powdered material is heated with distilled water for about 20–30 minutes to extract the active components. The solution is then filtered to obtain a clear extract.[22]

- **Step 2: Preparation of Gel Base**

Carbopol 940 is slowly added to distilled water with continuous stirring and left undisturbed for around 30 minutes to allow complete hydration and formation of the gel base.[23]

### ▪ **Step 3: Mixing of Ingredients**

Aloe vera gel, glycerin, and propylene glycol are incorporated into the hydrated Carbopol base. The mixture is stirred properly until a smooth and homogeneous consistency is achieved.

### ▪ **Step 4: Neutralization**

Triethanolamine is added gradually with continuous stirring to adjust the pH to the desired range of 5–6. This step also helps in converting the mixture into a gel-like serum.[24]

### ▪ **Step 5: Final Formulation**

Finally, the hibiscus extract and preservative are added to the base. The formulation is mixed thoroughly and filled into a clean, suitable container for storage.[25]

## **Quality Control Test For Herbal Antiacne Serum :**

To ensure the effectiveness, safety, and quality of the prepared formulation, various physicochemical parameters were evaluated using standard procedures.

### 1. Colour

The colour of the serum was examined visually against a white background to clearly observe its appearance and uniformity.[25]

### 2. Odour (Aroma)

The aroma of the formulation was assessed by two methods:

Slight heating of the sample to observe any change in odour.

Direct smelling by a group of 5–6 individuals (both males and females) to evaluate acceptability.

### 3. Appearance (Clarity and Texture)

The formulation was inspected visually to evaluate its clarity, smoothness, and overall physical appearance.[26]

### 4. pH Determination

A 1% solution of the serum was prepared to measure pH. The pH meter was calibrated using standard buffer solutions (pH 4 and pH 7). The pH was then recorded at room temperature. The ideal pH range for skin application is 5–6.

### 5. Dirt Dispersion Test

A 1% solution of the sample was prepared in a measuring cylinder and shaken 10 times. A small amount of ink was added to observe dispersion. If ink remains in the foam, the formulation is considered to have poor cleansing ability; if it disperses in water, it indicates good quality.[27]

### 6. Wetting Time

A cotton fabric disc (1 inch diameter) was placed on the surface of a 1% sample solution. The time taken for the disc to sink was recorded as wetting time. Shorter wetting time indicates better efficiency of the formulation.

### 7. Foam Forming Ability

About 50 ml of 1% sample solution was taken in a 100 ml measuring cylinder and shaken vigorously 10 times. The foam height was measured after 1 minute to evaluate foaming ability.

### 8. Foam Stability

The stability of foam was determined by recording the foam volume after shaking and observing its retention over time. Stable foam indicates good formulation quality.[28]

### 9. Moisture Content

Approximately 10 g of the sample was heated in a hot air oven at 100–105°C for one hour. The weight difference before and after heating was used to calculate moisture content using the formula:[29]

### 10. Skin Irritation Test

The formulation was applied to a small area of clean skin and observed for 24 hours for any signs of irritation such as redness, itching, or burning. Absence of such reactions indicates the formulation is safe for topical use.[30]

## Result:

**Table No: 4- Tests , First Formulation and Second Formulations**

Sr No.	Test	F1	F2
1	Colour	Light Pink Uniform	Slightly darker Pink
2	Odour	Mild & Pleasant	Mild, slightly, stronger aroma
3	Appearance	Clear & Smooth	Clear, slightly more viscous
4	pH	5.5	5.8
5	Dirt dispersion	Dirt dispersed in water	Dirt dispersion in water
6	Wetting time	Short (good wetting)	Slightly shorter better wetting

7	Foam Ability	Moderate foam	Moderate to good foam
8	Foam Stability	Stable	More stable than F1
9	Moisture Content	Within acceptable limit	Within acceptable limit
10	Skin Irritation Test	No irritation	No irritation
11	Viscosity	Suitable for serum	Slightly higher viscosity
12	Spreadability	Easily spreadable	Smooth & better
13	Stability study	No significant change	No significant change

[32]

**Fig No: 1.7 F1 Observation****Fig No : 1.8 F2 Observation**

**Discussion:**

Two herbal anti-acne serum formulations (F1 and F2) containing Hibiscus rosa-sinensis extract were prepared and evaluated. Both formulations showed good physical appearance, smooth texture, and acceptable odour. The pH of both was within the suitable skin range(5-6) , indicating safety for topical use.

Performance tests such as dirt dispersion, wetting time, and foam properties were satisfactory in both formulations. However, F2 showed slightly better results in terms of viscosity, spreadability, and foam stability. Both formulations remained stable during storage and showed no signs of skin irritation.

Overall, while both F1 and F2 were effective and safe, F2 demonstrated comparatively better performance.

**Summary:**

Two herbal anti-acne serum formulations (F1 and F2) containing Hibiscus rosa-sinensis extract were successfully prepared and evaluated. Both formulations exhibited good physical characteristics, including smooth texture, pleasant odour, and suitable pH (5–6), ensuring compatibility with skin. Performance tests such as dirt dispersion, wetting time, and foam properties were satisfactory for both.

However, F2 showed comparatively better results in terms of viscosity, spreadability, and foam stability. Both formulations remained stable during storage and were non-irritant to the skin. Overall, while both formulations were effective and safe, F2 demonstrated superior performance.

**Conclusion:**

The present study successfully developed a herbal anti-acne serum using Hibiscus rosa-sinensis extract. The prepared formulations (F1 and F2) showed acceptable physicochemical properties, [40]including suitable pH, good consistency, and stability. Both formulations were found to be safe for topical application as no skin irritation was observed.[41]

Among the two, F2 exhibited slightly better performance in terms of viscosity, spreadability, and overall stability. [42] The presence of hibiscus extract may contribute to anti-acne activity by reducing inflammation and controlling excess oil.[43]

Thus, the formulated herbal serum can be considered a safe and effective alternative for acne management and skin care.[44]

**Future Perspective:**

Further investigation can be carried out through clinical studies to evaluate the effectiveness of the formulation on human subjects.

- Advanced techniques such as chromatographic and spectroscopic analysis can be used to identify and quantify the active constituents.[48]
- The formulation can be enhanced by incorporating additional herbal ingredients with known anti-acne properties.
- Extended stability studies may be performed to determine the shelf life of the product.
- The possibility of large-scale manufacturing and commercialization can be explored.[49]

- Safety evaluation through dermatological testing can be conducted to ensure the formulation is non-irritant and suitable for regular use.[49]

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