

Formulation And Evaluation Of Polyherbal Face Serum

**Mahesh Thakare*, Neha Shivaji Khedkar, Rutuja Rajendra Kokare,
Vijaykumar Kale, Vaibhav Narwade**

Kasturi Shikshan Sansthan College of Pharmacy, Shikrapur, Pune

ABSTRACT

In the pursuit of effective and natural skincare solutions, the cosmetic industry is progressively turning to herbal formulations with multifunctional benefits. This study presents the formulation and evaluation of a novel face serum combining the therapeutic properties of turmeric powder, amla powder, aloe vera, and rose water, complemented by moisturizing agents like glycerine and stabilizers such as gelatin, sodium benzoate, and citric acid. The selected ingredients offer a synergistic blend of antioxidant, anti-inflammatory, moisturizing, and skin-brightening properties, tailored for all skin types. The serum aims to promote skin hydration, improve texture, reduce pigmentation, and combat oxidative stress. A key focus of this research lies in achieving a balanced formulation that is both effective and dermatologically safe, with a naturally derived composition. Preliminary results indicate promising stability and user-friendly application characteristics, paving the way for broader application in herbal skincare products. Turmeric (*Curcuma longa*) and amla (*Emblica officinalis*) are well-documented for their potent antioxidant and anti-inflammatory effects, which help in reducing pigmentation, soothing irritation, and preventing oxidative damage. Aloe vera provides soothing, moisturizing, and healing benefits, while rose water acts as a natural toner with mild astringent and anti-aging properties. Glycerine serves as a humectant, enhancing moisture retention, and gelatin provides mild tightening and film-forming action. Sodium benzoate and citric acid function as preservatives and pH regulators, ensuring microbial stability and maintaining the integrity of the serum. The formulation process involved cold homogenization techniques to preserve the bioactivity of natural ingredients. The prepared serum underwent preliminary physicochemical evaluations including pH, viscosity, spreadability, stability studies under various conditions, and organoleptic characteristics. Early results indicate favourable consistency, acceptable pH (within the skin-compatible range), and good stability over a 30-day observation period. No phase separation, colour change, or microbial growth was observed. This research underlines the potential of combining traditional herbal knowledge with modern cosmetic science to create a safe, affordable, and efficient skincare product.

Keywords: polyherbal formulation, Natural skincare, Antioxidant activity, Herbal face serum, Turmeric and amla extract, Moisturizing and anti-Inflammatory.

INTRODUCTION

In recent years, consumer preference has markedly shifted toward natural and plant-based skincare products, driven by concerns over synthetic chemicals and a growing awareness of traditional remedies. The convergence of Ayurveda and modern cosmetic science has opened avenues for formulating products that are both effective and environmentally conscious. This study explores the development of a herbal face serum utilizing turmeric (*Curcuma longa*) powder, amla (*Emblica officinalis*) powder, aloe vera extract, and rose water as its core bioactive ingredients.

Turmeric is renowned for its curcumin content, offering anti-inflammatory and antioxidant properties. Amla, rich in Vitamin C and tannins, supports skin rejuvenation and collagen production. Aloe vera contributes to hydration and soothing, while rose water offers a mild astringent effect and a pleasant fragrance. These natural actives are supported by glycerine, a humectant that enhances skin moisture retention; gelatin, which aids in formulation viscosity and skin tightening; and preservatives like sodium benzoate and citric acid to ensure product safety and stability.

The present research aims to formulate a face serum that encapsulates these diverse benefits into a single

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

product. This paper details the formulation process, ingredient compatibility, physicochemical properties, and potential benefits, highlighting the potential of this serum as a cost-effective, natural skincare solution in the modern cosmetic landscape. This project focuses on the formulation and evaluation of a polyherbal face serum using naturally derived ingredients known for their synergistic skincare benefits. The key components—turmeric powder (*Curcuma longa*) and amla powder (*Emblica officinalis*)—are rich in antioxidants and possess anti-inflammatory, antimicrobial, and skin-brightening properties. Aloe vera gel offers deep moisturization and healing effects, while rose water serves as a soothing, toning, and mildly astringent agent. To enhance the serum's texture and stability, glycerine is incorporated as a humectant, gelatin as a natural film-forming agent, and citric acid and sodium benzoate as preservatives and pH stabilizers.

The aim of this study is to develop a stable, dermatologically safe, and effective herbal face serum that can hydrate the skin, improve texture, reduce pigmentation, and protect against oxidative stress. This formulation seeks to provide a natural alternative to synthetic serums, aligning with the principles of green chemistry and sustainable cosmetic development. The evaluation includes physicochemical testing and stability studies to ensure the product's performance and shelf-life.

A polyherbal formulation is a therapeutic or cosmetic product composed of more than one herbal ingredient, typically derived from medicinal plants, used in combination to achieve enhanced efficacy. Unlike monoherbal preparations, which rely on a single plant extract, polyherbal systems utilize the synergistic potential of multiple herbs that work together to provide broader and more potent benefits.

This concept is deeply rooted in traditional medicine systems such as Ayurveda, Siddha, and Unani, which have long emphasized the use of multi-herb combinations to restore balance in the body and promote holistic health. Each herb in a polyherbal formula is selected based on its unique pharmacological profile and its ability to complement the actions of other ingredients.

In the context of modern cosmetic science, polyherbal formulations offer a natural, safe, and effective

alternative to synthetic skincare products. When used in topical applications such as face serums, polyherbal combinations can address multiple skin concerns simultaneously—such as dryness, inflammation, pigmentation, and aging—providing a comprehensive skincare solution.

2. SYNERGISTIC EFFECT OF COMBINING MULTIPLE HERBS

The most important principle behind polyherbal formulations is synergy. Synergy refers to the phenomenon where the combined effect of two or more herbs is greater than the sum of their individual effects. This happens because the various bioactive compounds in each plant may:

1. Enhance each other's activity,
2. Improve absorption and bioavailability,
3. Offset potential side effects,
4. Act on different biochemical pathways to produce a multifaceted therapeutic outcome.

For example, in a polyherbal face serum:

1. Turmeric offers anti-inflammatory and antibacterial effects,
2. Amla provides antioxidants and vitamin C to support collagen synthesis,
3. Aloe vera hydrates and soothes the skin,
4. Rose water tones and refreshes the skin.

Together, these ingredients can offer enhanced skincare benefits, such as reduced acne, improved complexion, and better skin texture, than any one of them could achieve alone.

Moreover, supporting herbs can modulate the delivery of active constituents, stabilize the formulation, and reduce the irritation or toxicity sometimes caused by concentrated single extracts.

3. BENEFITS OF USING POLYHERBAL FORMULATIONS IN SKINCARE

The application of polyherbal combinations in skincare, especially in products like face serums, has several advantages:

a. Multifunctional Action

Polyherbal formulations can address multiple skin concerns at once—hydrating the skin, treating acne, reducing pigmentation, and providing antioxidant protection—all in a single product.

b. Improved Efficacy

The synergistic effect leads to faster and more pronounced results. For example, turmeric and aloe vera together may accelerate wound healing and reduce inflammation more effectively than when used alone.

c. Reduced Risk of Side Effects

Combining herbs with complementary or balancing actions can minimize potential irritation. For example, aloe vera can reduce the potential drying effect of citric acid.

d. Better Skin Tolerance

Herbal ingredients, being close to the skin's natural composition, are often better tolerated than synthetic chemicals. Polyherbal formulas can be customized for sensitive, oily, or dry skin types.

e. Natural and Holistic Approach

Polyherbal skincare aligns with the growing consumer preference for clean, green, and cruelty-free products. It reflects a holistic philosophy that not only treats symptoms but supports the skin's overall health and balance.

f. Potential for Innovation

Formulators can explore an almost endless variety of combinations, making polyherbal products a fertile ground for innovation and personalized skincare solutions.

Skin Structure and Using Polyherbal Face Serum According to Skin type

Structure of the Skin

The skin is the largest organ of the human body, functioning as a protective barrier and playing a critical role in thermoregulation, sensory perception, and immune defence. It is composed of three primary layers:

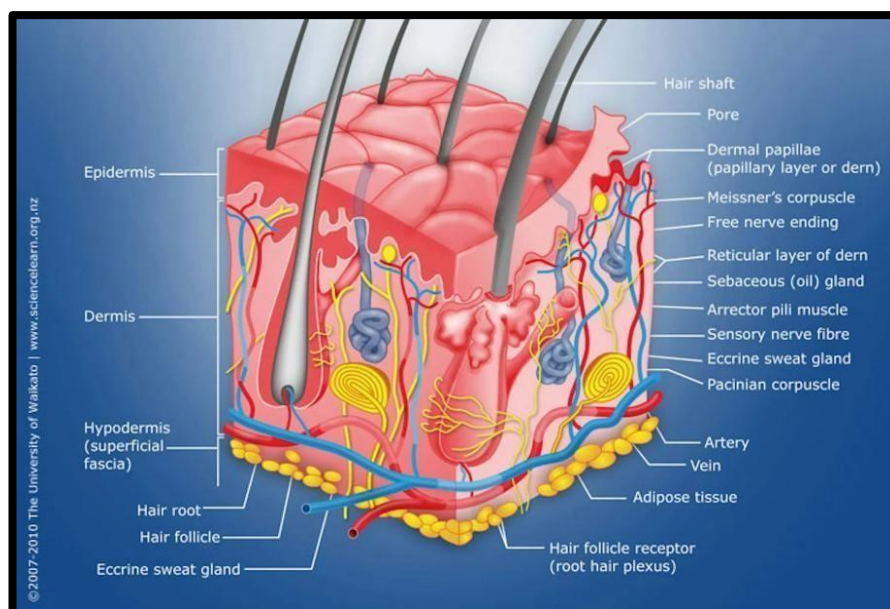


Fig.1.1 Structure of skin

1. Epidermis

- Outer layer composed mainly of keratinocytes.
- It provides a barrier function against environmental damage, pathogens, and water loss.

- Contains melanocytes, responsible for pigment production, and Langerhans cells, which are part of the immune system.
- Divided into several sublayers, including the stratum corneum (outermost layer) and stratum basale (innermost layer where cell division occurs).

2. Dermis

- Located beneath the epidermis and composed of connective tissue, primarily collagen and elastin fibers.
- Contains blood vessels, lymph vessels, nerve endings, sebaceous glands, and sweat glands.
- Provides nutrients to the epidermis and regulates skin temperature.

3. Hypodermis (Subcutaneous Layer)

- Composed mainly of fat and connective tissue.
- Acts as an insulator and shock absorber.
- Stores energy and helps anchor the skin to underlying muscles and bones.

Understanding the skin's structure is essential for designing cosmetic products like face serums. The goal is to deliver active ingredients effectively to targeted layers without disrupting the natural balance of the skin.

Importance of Polyherbal Face Serum

A polyherbal face serum combines the benefits of multiple herbal ingredients, enhancing skin nourishment, hydration, and rejuvenation. The selected herbs such as turmeric, amla, aloe vera, rose water, and glycerin offer antioxidant, anti-inflammatory, moisturizing, and antimicrobial effects.

The efficiency of any cosmetic formulation depends on its compatibility with the user's skin type. Therefore, tailoring a polyherbal serum to different skin types enhances its benefits and prevents adverse reactions.

Classification of Skin Types and Serum Recommendations

1. Normal Skin

- Characteristics: Balanced moisture and oil; smooth texture; minimal sensitivity or imperfections.
- Recommended Serum Use:
 - Ingredients: Aloe vera (hydrating), rose water (toning), turmeric (anti-inflammatory).
 - Light formulation with moderate glycerin content to maintain hydration.
 - Use 1-2 times daily for healthy skin maintenance.

2. Oily Skin

- Characteristics: Excess sebum production; shiny appearance; enlarged pores; acne-prone.
- Recommended Serum Use:
 - Ingredients: Turmeric (antibacterial), amla (astringent), aloe vera (soothing).
 - Reduce glycerin concentration and avoid heavy oils.
 - Use once daily, preferably at night, to reduce oil and fight acne without clogging pores.

3. Dry Skin

- Characteristics: Flaky, rough texture; tight feeling; more prone to irritation.
- Recommended Serum Use:
 - Ingredients: Glycerin (humectant), aloe vera (moisturizing), rose water (soothing).
 - Add more glycerin and gelatin for intense hydration.
 - Use 2-3 times daily, especially after cleansing.

4. Combination Skin

- Characteristics: Oily in the T-zone (forehead, nose, chin) and dry/normal elsewhere.
- Recommended Serum Use:
 - Ingredients: Aloe vera (balancing), turmeric (regulates oil), rose water (refreshes).
 - Apply lightly on oily areas and more generously on dry patches.
 - Use once or twice daily depending on skin condition.

5. Sensitive Skin

- Characteristics: Easily irritated; redness; allergic reactions to many products.
- Recommended Serum Use:
 - Ingredients: Aloe vera (anti-inflammatory), rose water (gentle toner), low turmeric (in reduced concentration).
 - Avoid strong acids or fragrances.
 - Patch test is recommended before use.

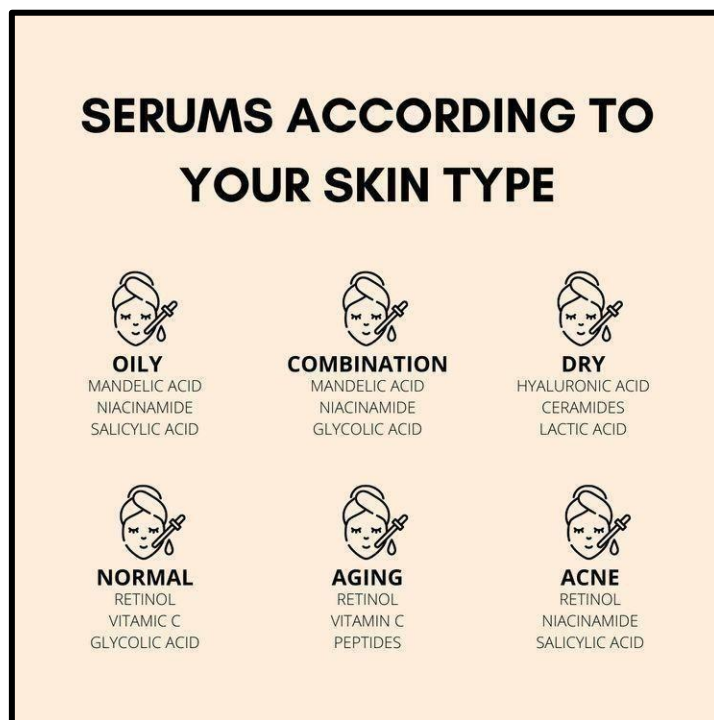


Fig. 1.2 Serum according to skin type

Application Guidelines

To ensure optimal results from a polyherbal serum:

- Cleanse the face thoroughly before application.
- Apply 2–3 drops of serum to the fingertips and gently massage onto the skin in upward circular motions.
- Allow absorption for 2–5 minutes before applying moisturizer or sunscreen.
- Use consistently for several weeks to notice visible improvements.



Fig. 1.3 steps to apply face serum

BENEFITS OF FACE SERUM

Brighten skin tone:

Turmeric has curcumin, which helps fade dark spots and evens out complexion, while amla (Indian gooseberry) is rich in Vitamin C, boosting overall skin radiance.

Fights acne and inflammation:

Turmeric is anti-inflammatory and antibacterial, so it calms redness, pimples, and irritation. Amla also soothes and helps heal acne faster.

Strong antioxidant protection:

Both turmeric and amla are loaded with antioxidants, which protect your skin from damage caused by pollution, sun, and stress.

Reduces signs of aging:

Amla boosts collagen production (thanks to its high Vitamin C content), helping to firm up the skin and reduce fine lines. Turmeric's antioxidants help keep skin looking youthful.

Natural glow:

Regular use can give your skin that "lit from within" healthy glow — not oily, but fresh and vibrant.

Detoxifies and purifies:

These ingredients help cleanse pores and keep skin clear and smooth over time

TYPES OF FACE SERUM

1. Hydrating Serums

Hydrating serums are primarily designed to replenish and retain moisture in the skin. These serums contain humectants—substances that draw water into the skin—such as hyaluronic acid, glycerin, and panthenol.

Key Ingredients:

- Hyaluronic acid
- Glycerin
- Aloe vera
- Sodium PCA

Benefits:

- Improve skin elasticity
- Alleviate dryness and flakiness
- Provide a plump, dewy appearance
- Strengthen the skin barrier

Ideal For:

- Dry, dehydrated skin
- Sensitive skin

- Use during winter or in dry climates

2. Brightening Serums

Brightening serums are formulated to reduce dullness, hyperpigmentation, and uneven skin tone. These serums contain antioxidants and exfoliating agents that inhibit melanin production and promote cell renewal.

Key Ingredients:

- Vitamin C (ascorbic acid)
- Niacinamide (Vitamin B3)
- Alpha arbutin
- Licorice extract
- Amla (Emblica officinalis)

Benefits:

- Fades dark spots and pigmentation
- Boosts skin radiance
- Neutralizes free radicals
- Promotes even skin tone

Ideal For:

- Dull and uneven skin
- Hyperpigmentation and sun damage
- Post-acne marks

3. Anti-Aging Serums

Anti-aging serums are aimed at reducing visible signs of skin aging such as wrinkles, fine lines, and sagging. These formulations often include peptides, retinoids, and antioxidants to stimulate collagen synthesis and promote cell regeneration.

Key Ingredients:

- Retinol (Vitamin A)
- Peptides
- Coenzyme Q10
- Vitamin E

- Green tea extract

Benefits:

- Minimizes wrinkles and fine lines
- Improves firmness and elasticity
- Boosts collagen production
- Provides antioxidant protection

Ideal For:

- Mature skin
- Premature aging due to sun exposure or pollution

4. Acne-Fighting Serums

These serums are designed for oily and acne-prone skin and contain antimicrobial and anti-inflammatory agents that prevent and reduce breakouts.

Key Ingredients:

- Salicylic acid
- Tea tree oil
- Niacinamide
- Zinc
- Turmeric

Benefits:

- Unclogs pores
- Reduces inflammation and redness
- Controls sebum production
- Prevents future breakouts

Ideal For:

- Oily skin
- Acne-prone or sensitive skin
- Teenagers and young adults

5. Exfoliating Serums

Exfoliating serums remove dead skin cells from the surface and promote the growth of new skin cells. They often contain alpha and beta hydroxy acids (AHAs and BHAs).

Key Ingredients:

- Glycolic acid
- Lactic acid
- Citric acid
- Salicylic acid

Benefits:

- Smoothens skin texture
- Reduces clogged pore
- Enhances product absorption
- Improves skin tone

Ideal For:

- Rough, textured skin
- Enlarged pores
- Hyperpigmentation and acne scars

6. Antioxidant Serums

These serums protect the skin from oxidative stress caused by environmental factors like UV radiation and pollution. They are rich in ingredients that neutralize free radicals.

Key Ingredients:

- Vitamin C
- Vitamin E
- Ferulic acid
- Green tea extract
- Resveratrol

Benefits:

- Prevent premature aging
- Protect skin from environmental damage

- Brighten and refresh complexion

Ideal For:

- Urban environments
- Daily preventive skincare

7. Soothing and Repair Serums

These are formulated to calm irritation, reduce redness, and support skin healing. They are especially useful for sensitive or post-procedure skin.

Key Ingredients:

- Aloe vera
- Chamomile extract
- Centella asiatica
- Allantoin
- Calendula

Benefits:

- Reduces inflammation
- Accelerates healing
- Strengthens skin barrier
- Soothes redness and discomfort

Ideal For:

- Sensitive, irritated skin

ADVANTAGES OF HERBAL FACE SERUM

1. Natural Ingredients with Fewer Side Effects

Herbal serums are made from plant-based extracts, making them gentler on the skin compared to synthetic products. They are less likely to cause irritation, allergic reactions, or long-term damage.

2. Rich in Antioxidants

Ingredients like turmeric, amla, and aloe vera are loaded with antioxidants that help neutralize free radicals. This reduces signs of aging such as wrinkles, fine lines, and dullness.

3. Improves Skin Texture and Tone

Polyherbal serums can reduce pigmentation, lighten blemishes, and even out skin tone naturally, giving a brighter and more radiant complexion.

4. Hydrating and Moisturizing

Ingredients like glycerin, aloe vera, and rose water are powerful humectants. They help retain skin moisture, making the skin soft, supple, and hydrated without clogging pores.

5. Anti-Inflammatory and Soothing

Herbs like turmeric and aloe vera possess anti-inflammatory properties that calm irritated skin, reduce redness, and treat acne-prone or sensitive skin.

6. Safe for All Skin Types

Since herbal serums do not contain harsh chemicals, sulfates, or parabens, they are generally safe for dry, oily, sensitive, or combination skin types.

7. Supports Skin Healing

Herbal ingredients often have antimicrobial and wound-healing properties. They help reduce acne scars, heal small cuts, and improve overall skin regeneration.

8. Environmentally Friendly

Herbal serums are usually biodegradable, and their production has a smaller environmental footprint compared to synthetic alternatives.

9. Multifunctional Benefits

A single herbal serum can provide multiple skincare benefits—moisturizing, brightening, anti-aging, and acne control—making it a cost-effective and simplified skincare choice.

10. Boosts Collagen Production

Ingredients like amla are rich in Vitamin C, which promotes collagen synthesis, improving skin firmness and elasticity.

DISADVANTAGES OF HERBAL FACE SERUM

1. Potential for Allergic Reactions

Even though herbal serums are natural, they can still cause skin allergies or irritations in some people,

especially those with sensitive skin or pollen-related allergies.

2. Shorter Shelf Life

Natural ingredients tend to decompose more quickly than synthetic ones, especially if not preserved properly. This can lead to a reduced shelf life and the need for refrigeration or the use of mild preservatives like sodium benzoate.

3. Variation in Potency

Herbal extracts may vary in strength depending on factors like seasonal harvests, extraction methods, and storage conditions, which can result in inconsistent product effectiveness.

4. Slower Results

Unlike chemical-based serums that may produce instant or faster results, herbal serums work gradually and require longer periods of consistent use to show visible effects.

PLANT PROFILE

1. Turmeric



Fig.6.1 Turmeric (*Curcuma longa*)

Botanical Name: *Curcuma longa* Family: Zingiberaceae

Common Names: Turmeric, Haldi (Hindi), Haridra (Sanskrit), Curcuma Part Used: Rhizome

Habitat: Native to South Asia; widely cultivated in India, China, Indonesia, and other tropical regions.

Botanical Description:

Turmeric is a perennial herbaceous plant that grows up to 1 meter in height. It has broad, oblong leaves and yellowish-white flowers arranged in spikes. The rhizomes, which grow underground, are the most important part of the plant for medicinal and cosmetic purposes. They are cylindrical, aromatic, and have a bright yellow to orange interior due to the presence of curcumin.

Phytochemical Constituents:

- Curcuminoids (Curcumin, DMC, BDMC) – responsible for antioxidant, anti-inflammatory, and colorant properties.
- Essential oils (Turmerone, Zingiberene, Atlanone) – possess antimicrobial and aromatic properties.
- Proteins, resins, starch, and sugars.

Pharmacological Activities:

- Antioxidant: Curcumin neutralizes free radicals and prevents oxidative stress.
- Anti-inflammatory: Reduces inflammation by inhibiting pro-inflammatory mediators.
- Antimicrobial: Effective against a broad spectrum of bacteria and fungi.
- Wound healing: Promotes tissue regeneration and healing of cuts and scars.
- Skin brightening: Reduces hyperpigmentation and improves skin tone.
- Anti-aging: Protects skin cells from damage, reducing wrinkles and fine lines.

Cosmetic Applications:

- Used in face masks, creams, and serums for brightening and blemish reduction.
- Helps in treating acne, dark spots, and uneven skin tone.
- Acts as a natural colorant in herbal cosmetic formulations.

2. Amla



Fig. 6.2 (Emblica officinalis)

Amla (*Emblica officinalis*)

Botanical Name: *Emblica officinalis* (syn. *Phyllanthus Emblica*) Family: Phyllanthaceae

Common Names: Amla, Indian Gooseberry, Amalaki (Sanskrit)

Part Used: Fruit (dried or fresh), commonly processed into powder form Habitat: Native to India; also found in Sri Lanka, China, and Southeast Asia.

Botanical Description:

Amla is a small to medium-sized deciduous tree that grows up to 8–18 meters in height. It has feathery, light green leaves and greenish-yellow flowers. The fruit is round, smooth, and light green to yellow in colour, with six vertical stripes. It has a sour, astringent taste and is highly valued in Ayurvedic medicine.

Phytochemical Constituents:

- Vitamin C (AA) – present in high amounts, highly stable and potent antioxidant
- TAN (Emblicanin A and B, pedunculagin)
- Flavonoids (Kaempferol, quercetin)
- Phenolic compounds –GA, ellagic acid
- Alkaloids, carbohydrates, amino acids, and minerals

Pharmacological Activities:

- Antioxidant: Neutralizes free radicals, delays aging, and prevents oxidative skin damage
- Anti-inflammatory: Reduces skin inflammation and redness
- Antimicrobial: Inhibits growth of acne-causing bacteria
- Skin brightening: Helps reduce pigmentation and uneven skin tone
- Astringent: Tightens skin and reduces pore size
- Rejuvenating: Promotes skin regeneration and collagen production

Cosmetic Applications:

- Widely used in herbal face packs, serums, and hair care products
- Helps lighten dark spots and brighten complexion
- Reduces signs of aging such as wrinkles and fine lines
- Used in formulations targeting acne and dull skin.

3. Aloe vera



Fig.6.3 Aloe Vera (Aloe Barbadensis miller)

Botanical Name: Aloe barbadensis miller (ABM)
Family: Asphodelaceae (formerly Liliaceae)

Common Names: Aloe vera, Ghritkumari (Hindi), Kumari (Sanskrit), Burn plant

Part Used: Leaf gel (inner parenchymatous tissue)

Habitat: Native to North Africa and the Arabian Peninsula; widely cultivated in tropical and subtropical regions, including India.

Botanical Description:

Aloe vera is a succulent, perennial plant with thick, fleshy, green leaves arranged in a rosette pattern. The leaves contain a clear, mucilaginous gel in the inner tissue and a yellow latex just beneath the skin. The gel is widely used for its soothing and healing properties in both cosmetic and medicinal formulations.

Phytochemical Constituents:

- Polysaccharides: GLU – responsible for moisturizing and wound healing
- Glycoproteins: Help reduce inflammation and promote skin repair
- Vitamins: A, C, E (antioxidants), B-complex, and folic acid
- Enzymes: Brady kinase, amylase, lipase – reduce inflammation and help in tissue breakdown
- Minerals: Calcium, magnesium, zinc, selenium
- Anthraquinones: Aloin, emodin (in outer leaf latex – used with caution)
- Amino acids: Including 7 of the 8 essential amino acids

Pharmacological Activities:

- Moisturizing: Hydrates the skin and prevents dryness
- Anti-inflammatory: Reduces redness, swelling, and irritation
- Wound healing: Accelerates cell regeneration and collagen synthesis
- Antioxidant: Protects skin cells from oxidative damage

- **Antimicrobial:** Exhibits mild antibacterial and antifungal properties
- **Cooling and soothing:** Relieves sunburns, itching, and rashes

Cosmetic Applications:

- Commonly used in face serums, creams, gels, masks, and after-sun products
- Helps calm irritated or inflamed skin and treats acne and blemishes
- Enhances skin elasticity and slows the appearance of aging
- Acts as a natural base in herbal formulations for better ingredient absorption

4. Rose Water



Fig. 6.4 Rose Water (Hair Buddha)

Key Properties:

- **Natural Toner:** Tightens pores and cleanses skin gently.
- **Anti-inflammatory:** Soothes irritated and sensitive skin.
- **Fragrant:** Imparts a pleasant, natural aroma.

Role in Skincare:

- **Balances Skin pH:** Helps maintain the skin's natural acid mantle.
- **Refreshes and Hydrates:** Used for a refreshing mist or a base in serums for added hydration.

5. Glycerin



Fig. 6.5 Glycerine (Purish)

Key Properties:

- **Humectant:** Attracts water from the environment and deeper layers of the skin.
- **Non-irritating and Non-comedogenic:** Suitable for sensitive and acne-prone skin.

Role in Skincare:

- **Hydration Booster:** Keeps skin soft, supple, and plump.
- **Improves Barrier Function:** Strengthens the skin's natural protective layer.

6. Gelatin

Key Properties:

- **Film-forming Agent:** Creates a thin layer on the skin which helps in tightening.
- **Protein-rich:** Derived from collagen, helping in improving skin texture.

Role in Skincare:

- **Tightening and Firming:** Gives a temporary lifting effect, useful in anti-aging products.

- **Thickener:** Provides structure and stability to gel-based formulations.

7. Citric Acid

Key Properties:

- **Alpha Hydroxy Acid (AHA):** Promotes exfoliation of dead skin cells.
- **Natural pH Adjuster:** Maintains ideal pH for skin-friendly formulations.

Role in Skincare:

- **Brightens Skin:** Removes dead cells and reveals fresher skin beneath.
- **Exfoliates Gently:** Improves skin tone and texture over time.

8. Sodium Benzoate Key Properties:

- **Antimicrobial Preservative:** Inhibits growth of yeast, mold, and bacteria.
- **Widely Accepted:** Commonly used in cosmetic and pharmaceutical formulations.

Role in Skincare:

- **Extends Shelf Life:** Ensures safety and effectiveness of the serum over time.
- **Maintains Product Integrity:** Prevents microbial contamination in water-based formulations.

7. MATERIAL AND METHOD

❖ INGREDIENTS

ingredients and Quantities for 100ml Face Serum

SR. NO	INGREDIENTS	QUANTITY
1	Turmeric extract (3%)	3g
2	Amla extract (1%)	1g
3	Aloe vera gel (20%)	20g
4	Rose water (30%)	30ml
5	Glycerin (30%)	30g
6	Sodium benzoate (0.5%)	0.5g
7	Citric acid (0.5%)	0.5g
8	Gelatin (1%)	1g (optional, for texture)
9	water	15ml

1.1 Ingredients and their quantity

COLLECTION AND PREPARATION

1. Choose organic or sustainably sourced turmeric: Ensure the turmeric is free of pesticides and other contaminants.
2. Select high-curcumin content turmeric: Opt for turmeric with a high curcumin content (typically 2-5%) for maximum benefits.



Fig.7.1 Collection of Turmeric powder

2. Amla powder: Collect dried amla powder or create your own by drying and grinding amla fruits.
3. Amla extract: Obtain amla extract through solvent extraction or other methods.



Fig.7.2 Collection of Amla powder (Pure Indian Foods)

1. Fresh aloe vera leaves: Harvest fresh aloe vera leaves and extract the gel for use in face serum formulations.
2. Aloe vera gel: Obtain aloe vera gel through manual extraction or commercial sourcing.
3. Aloe vera extract: Obtain aloe vera extract through solvent extraction or other method



Fig.7.3 Collection of Aloe vera gel (iStock)

1. Weigh turmeric powder: Accurately weigh the desired amount of turmeric powder.
2. Mix with ethanol: Gradually add ethanol to the turmeric powder in the container, stirring constantly to prevent lumps.
3. Stir and sonicate: Continue stirring and sonicate the mixture for 10-15 minutes to facilitate dissolution.
4. Filter: Filter the solution through a coffee filter or cheesecloth to remove any undissolved particles.
5. Concentrate (optional): If desired, concentrate the solution by evaporating some of the ethanol under reduced pressure or using a rotary evaporator.

FORMULATION OF FACE SERUM

1. Mix turmeric and amla powders with aloe vera gel in a bowl.
2. Add glycerin and rose water to the mixture.
3. Dissolve gelatin in warm water and add to the mixture.
4. Add citric acid and sodium benzoate, mix well.
5. Stir until the mixture is smooth and well combined.





Fig.7.4 Formulation Of Face serum

DEVELOPMENT TRIALS

Trial No.1 :

1. Texture of serum is not smooth.
2. It was too thick to pour.

Trial No.2 :

1. It was too sticky difficult to absorb.
2. The amount of Glycerin used was insufficient.

Trial No.3:

1. viscosity of the serum is appropriate.
2. texture is smooth and gel like.
3. It easily absorbs into the skin.

EVALUATION TEST

The prepared face serum was evaluated for various parameters such as organoleptic properties, pH, viscosity, stability, patch test and was found to be satisfactory.

Organoleptic properties include:

- ✓ Colour
- ✓ Smell
- ✓ Texture
- ✓ Consistency

Physical Test

1. pH Test

Purpose:

To determine whether the serum's pH is compatible with the skin's natural pH (typically 4.5–5.5). A proper pH ensures the serum will not cause irritation or disrupt the skin's acid mantle.

Procedure:

- Calibrate a digital pH meter using standard buffer solutions (pH 4.0 and 7.0).
- Take a small quantity of the serum (approx. 5 mL) and dilute it slightly with distilled water if needed.
- Dip the electrode of the pH meter into the sample.
- Record the pH reading.

2. Viscosity Test Purpose:

To assess the serum's flow behaviour and texture, which influences spreadability, absorption, and user experience. The viscosity also affects the product's packaging and dispensing.

Procedure:

- Use a Brookfield viscometer or a rotational viscometer.
- Place a sufficient amount of serum in the sample holder.
- Immerse the spindle in the serum and record the viscosity at a set rotation speed (e.g., 20 rpm).
- Take readings at room temperature (~25°C).

3. Stability Test: Evaluate the serum's stability under various conditions (temperature, light, etc.).

Safety and Efficacy Tests:

1. Skin Irritation Test Purpose:

To assess whether the face serum causes any irritation, redness, inflammation, or allergic reaction

when applied to the skin. This is critical to ensure the safety of the product for human use.

Procedure:

- Select healthy human volunteers (commonly 10–20 individuals) with no known allergies.
- Clean a small area on the forearm or behind the ear with alcohol or distilled water.
- Apply a small amount (approx. 0.5 mL) of the serum to the site.
- Cover the area with a sterile patch (if needed) and observe for 24–48 hours.
- Remove the patch and assess for any signs of:
 - Redness (erythema)

- Swelling (edema)

2. Patch Test Purpose:

To detect any hypersensitivity or allergic reaction to the face serum before full-face application, especially useful for sensitive individuals.

Procedure:

- Clean a small area of skin on the inner forearm or behind the ear.
- Apply a small amount (pea-sized) of the serum to the area.
- Leave it undisturbed for 24 hours (without washing).

EVALUATION PARAMETER

SR.NO	PARAMETER	OBSERVATION
1	odour	Mild herbal fragrance dominated by turmeric and rose water
2	colour	Light yellow to golden hue
3	texture	Smooth, gel like
4	consistency	Light yellow to golden hue
5	pH	Initial: 5.1; After stability: 5.0
6	Viscosity	950–1100 cps (centipoise) at 25°C
7	Stability Test	No colour change, no phase separation, no odour change, across various conditions (4°C, 25°C, 40°C, light exposure)
8	Skin Irritation Test	No redness, swelling, or itching after 48 hours on volunteers
9	Patch Test	No adverse reaction observed after 24 hours

1.2 Evaluation Parameter

8. RESULT AND DISCUSSION

Result:

A polyherbal face serum was successfully formulated using turmeric powder, amla powder, aloe vera gel,

glycerin, rose water, gelatin, citric acid, and sodium benzoate. The final product was a smooth, homogenous gel with a light herbal aroma and a yellowish appearance, primarily due to the turmeric content. The formulation exhibited moderate

viscosity, non-greasy texture, and good spreadability on the skin.

Discussion:

The ingredients selected in the formulation played specific and complementary roles:

- Turmeric is known for its anti-inflammatory and antibacterial properties, making it beneficial for acne-prone skin.
- Amla (Indian gooseberry) provides antioxidant support, which may help in skin rejuvenation and protection from oxidative stress.
- Aloe vera gel acted as a soothing, hydrating base with healing properties, contributing to the overall moisturizing effect.
- Glycerin served as a humectant, enhancing skin hydration by attracting water to the outer skin layer.
- Rose water added mild fragrance and acted as a skin toner, helping to balance the skin pH.
- Gelatin provided consistency and mild film-forming properties, giving the serum its gel-like texture.
- Citric acid adjusted the pH and provided mild exfoliating activity due to its alpha hydroxy acid nature.
- Sodium benzoate was used as a preservative to enhance the shelf-life of the product.

CONCLUSION

The combination of turmeric and amla in a face serum offers a powerful, natural solution for promoting healthy, radiant skin. Turmeric's potent anti-inflammatory and antioxidant properties help soothe irritation, reduce hyperpigmentation, and combat signs of aging, while amla's high vitamin C content and strong antioxidant capacity enhance skin brightness, elasticity, and overall vitality. Together, these ingredients work synergistically to protect the skin from environmental stressors, support collagen production, and improve skin tone and texture. Regular use of a turmeric and amla serum can contribute to a clearer, smoother, and more youthful

complexion, making it a valuable addition to natural skincare routines.

The face serum was successfully prepared and evaluated for various physicochemical and dermatological parameters. The final product exhibited a pleasant herbal aroma, light yellow colour, and smooth gel-like texture, which are favourable for consumer use. The pH of the serum was found to be 5.1, which is within the acceptable range for facial skin and indicates its mildness and compatibility with the skin's natural barrier.

The viscosity of the serum was found to be moderate, ensuring easy application and quick absorption without leaving a sticky residue. The stability studies conducted under different storage conditions (including refrigeration, room temperature, elevated temperature, and light exposure) revealed that the formulation remained stable in terms of colour, odour, pH, and consistency for at least 30 days. This suggests good shelf-life potential and formulation robustness.

In conclusion, the developed polyherbal face serum demonstrated promising characteristics as a safe, effective, and natural skincare product. With further studies including large-scale clinical evaluations and advanced formulation techniques, this herbal serum can be scaled up for commercial production and contribute to the growing market for green, sustainable, and herbal cosmetics.

FUTURE SCOPE

1. Advanced Clinical Evaluation

- Conducting large-scale dermatological studies and clinical trials to confirm long-term safety and efficacy on diverse skin types, including sensitive, acne-prone, and aging skin.

2. Active Compound Isolation and Optimization

- Future research can focus on isolating and quantifying active phytoconstituents like curcumin (turmeric), emblicanin (aml), and acemannan (aloe vera) for enhanced formulation effectiveness.

3. Incorporation of Nanotechnology

- Nano formulations such as nano-emulsions or liposomes could be explored to improve penetration, bioavailability, and sustained release of herbal actives.

4. Customization for Skin Concerns

- Based on the herbal base, further modifications can target specific concerns such as anti-aging, anti-acne, or hyperpigmentation by adding suitable natural extracts or essential oils.

5. Scale-Up and Commercialization

- The formulation has potential for scale-up in the herbal cosmetic industry as a clean-label, preservative-free, eco-friendly product that meets rising consumer demand for natural skincare.

6. Shelf-Life Enhancement Studies

- Further studies can explore natural preservatives or packaging innovations to extend shelf life without compromising product integrity or efficacy.

7. Sustainability and Eco-Packaging

- Emphasis can be placed on sustainable sourcing of herbal ingredients and the use of biodegradable or recyclable packaging materials for an environmentally conscious product line.

REFERENCES

1. Hewlings, S. J., & Kalman, D. S. (2017). Curcumin: A Review of Its Effects on Human Health. *Foods*, 6(10), 92.
2. Vaughn, A. R., Branum, A., & Sivamani, R. K. (2016). Effects of turmeric (*Curcuma longa*) on skin health: A systematic review of the clinical evidence. *Phytotherapy Research*, 30(8), 1243–1264.
3. Chainani-Wu, N. (2003). Safety and anti-inflammatory activity of curcumin: a component of turmeric (*Curcuma longa*). *The Journal of Alternative and Complementary Medicine*, 9(1), 161–168.
4. Gupta, S. C., Patchva, S., & Aggarwal, B. B. (2013). Therapeutic roles of curcumin: lessons learned from clinical trials. *AAPS Journal*, 15(1), 195–218.
5. Scartezzini, P., & Speroni, E. (2000). Review on some plants of Indian traditional medicine with antioxidant activity. *Journal of Ethnopharmacology*, 71(1-2), 23-43.
6. Ghosal, S., Tripathi, V. K., & Chauhan, S. (1996). Active constituents of *Embllica officinalis*: Part 1—the chemistry and antioxidant effects of two new hydrolysable tannins, emblicanin A and B. *Indian Journal of Chemistry*, 35B(10), 941-948.
7. Krishnaveni, M., & Mirunalini, S. (2010). Therapeutic potential of *Phyllanthus emblica* (amla): the ayurvedic wonder. *Journal of Basic and Clinical Physiology and Pharmacology*, 21(1), 93–105.
8. Baliga, M. S., & Dsouza, J. J. (2011). Amla (*Embllica officinalis* Gaertn), a wonder berry in the treatment and prevention of cancer. *European Journal of Cancer Prevention*, 20(3), 225-239.
9. Sarin, B., Verma, N., Martín, J. P., & Mohanty, A. (2014). An overview of important ethnomedicinal herbs of *Phyllanthus* species: Present status and future prospects. *The Scientific World Journal*, 2014, 839172.
10. Surjushe, A., Vasani, R., & Saple, D. G. (2008). Aloe vera: A short review. *Indian Journal of Dermatology*, 53(4), 163–166.
11. Boskabady, M. H., Shafei, M. N., Saberi, Z., & Amini, S. (2011). Pharmacological effects of *Rosa damascena*. *Iranian Journal of Basic Medical Sciences*, 14(4), 295–307.
12. Fluhr, J. W., Darlenski, R., & Angelova-Fischer, I. (2008). Glycerol and the skin: Holistic approach to its origin and functions. *British Journal of Dermatology*, 159(1), 23–34.
13. Kornhauser, A., Coelho, S. G., & Hearing, V. J. (2010). Applications of hydroxy acids: Classification, mechanisms, and photoactivity. *Clinics in Dermatology*, 28(5), 523–532.
14. Kumar, N., Reddy, B. S., & Raju, A. S. (2012). Formulation and evaluation of herbal anti-aging cream containing aloe vera, turmeric, and amla extract. *International Journal of Pharmaceutical Sciences Review and Research*, 15(1), 91-95.
15. Mukherjee, P. K., Maity, N., Nema, N. K., & Sarkar, B. K. (2011). Bioactive compounds from

natural resources against skin aging.
Phytomedicine, 19(1), 64–73.

HOW TO CITE: Mahesh Thakare*, Neha Shivaji Khedkar, Rutuja Rajendra Kokare, Vijaykumar Kale, Vaibhav Narwade, Formulation And Evaluation Of Polyherbal Face Serum, Int. J. Sci. R. Tech., 2026, 3 (6), 822-840. <https://doi.org/10.5281/zenodo.20678738>