Formulation And Evaluation of Anti-Aging Face Serum

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***Abstract*- This face serum is a lightweight, fast-absorbing skincare product formulated to target key skin concerns such as hydration, brightening, anti-aging, and skin texture improvement. It is enriched with a potent blend of active ingredients including hyaluronic acid, niacinamide, vitamin C, and botanical extracts that work synergistically to nourish the skin, reduce the appearance of fine lines, and promote a radiant complexion. The serum is designed for all skin types and is free from parabens, sulfates, and artificial fragrances. Regular use of the serum results in visibly healthier, smoother, and more youthful-looking skin. Clinical evaluations and consumer testing have demonstrated its effectiveness and high tolerability, making it a valuable addition to any skincare routine.**

I. INTRODUCTION

In professional cosmetology, a concentrated solution known as serum is commonly used. The term "serum" originates from its own nature—an intensive formulation. Whether water-based or oil-based, cosmetic serums are as effective as traditional creams, but significantly more potent. In fact, a serum typically contains up to ten times more active organic ingredients than a regular cream.

Serum (in medical terms):
Serum is the clear, fluid component of blood that remains after clotting has taken place. It can be defined as blood plasma without clotting factors or as blood that has had both its cells and clotting factors removed. Serum plays a key role in diagnostics and medical research, but not in the clotting process itself.

Face Serum (in skincare):
A face serum is a topical formulation rich in active ingredients designed to penetrate deeply into the skin. These active ingredients may include antioxidants, vitamins, acids, and peptides. Unlike moisturizers or cleansers, serums contain fewer ingredients but deliver them in highly concentrated forms, making them highly effective in addressing specific skin concerns such as dryness, fine lines, dullness, acne, or uneven skin tone.

Serums are particularly valuable in modern skincare due to their ability to deliver micro-molecules of active compounds into deeper layers of the skin. This makes them more effective and faster-acting compared to other skincare products. By targeting underlying issues, face serums enhance the overall health and appearance of the skin.

Benefits of Face Serum

1. Lightweight and Non-Greasy: Easily absorbed without leaving a heavy residue.
2. Improves Skin Texture: Promotes a smoother, firmer skin surface.
3. Brightens the Complexion: Helps reduce dullness and enhances skin radiance.
4. Targeted Treatment: Addresses specific issues such as acne, wrinkles, or hyperpigmentation.
5. Enhances Absorption: Prepares the skin to better absorb other skincare products.
6. Anti-Aging Properties: Reduces the appearance of fine lines and wrinkles.
7. Environmental Protection: Shields the skin from pollutants and external stressors.

Face serums are considered essential in modern skincare routines for their potency and ability to transform the skin effectively and efficiently.

PLANT PROFILE

1.FENUGREEK(Trigonella foenum-graecum)

KINGDOM	Plantea
DIVISION	Magnoliophyta
FAMILY	Fabaceae (Legumes)
ORDER	Fabales

GENUS	Trigonella
SPECIES	foenum-graecum
BOTANICAL NAME	Trigonella foenum-graecum L
SYNONYMS	Methi, methya,
REGION	India, North Africa, Canada

BOTNICAL DESCRIPTION:

- Plant Type: Annual herb
- Height: 30–60 cm (1–2 feet)
- Stem: Erect and smooth
- Leaves: Light green, trifoliate (three leaflets per leaf), obovate to oblanceolate
- Flowers: Papilionaceous (pea-shaped), white to yellow, axillary, and sessile
- Fruits: Long, narrow, straight or slightly curved pods (2–10 cm)
- Seeds: Small, hard, yellowish-brown, oblong or square, with a characteristic odor
- Uses:

1. Anti-aging: Rich in antioxidants and anti-inflammatory agents, fenugreek helps reduce fine lines, wrinkles, and age spots.
2. Skin Brightening: It aids in evening out skin tone and reducing hyperpigmentation

2.PLUMERIA ALBA(CHAMPA)

Fig.no.2- Plumeria alba

KINGDOM	Plantea
DIVISION	Magnoliophyta
FAMILY	Apocynaceae
ORDER	Gentianales
GENUS	Plumeria
SPECIES	Alba
BOTANICAL NAME	Plumeria alba
SYNONYMS	Frangipani,caterpillar tree
REGION	India, North Africa, Canada

BOTNICAL DESCRIPTION

- Plant Form: Small, rounded, deciduous tree or shrub
- Height: 3–8 meters (10–25 feet)
- Leaves: Oblong-lanceolate, green, up to 30 cm long, spirally arranged at stem ends
- Flowers: Intensely fragrant, spiral-shaped, white with yellow centers, approx. 7 cm wide, blooming in terminal clusters

II. EXEPERIMENTAL WORK

Materials and Methods

A) Collection of Plant Material

Dried seeds of *Trigonella foenum-graecum* L. (fenugreek) and fresh flowers of *Plumeria alba* were collected from the local areas of Gondia district.

B) Instruments Used

Heating mantle

Soxhlet apparatus

Hot air oven

C) Preparation of Extracts

1)Preparation of Fenugreek Seed Extract

The fenugreek seeds were shade-dried at room temperature for 7 to 10 days. Once dried, they were ground into a fine powder using a mortar and pestle. The powdered seeds were then placed into a conical flask and immersed in an appropriate amount of methanol. The mixture was subjected to extraction using a Soxhlet apparatus for 3 to 4 days following the standard Soxhlet extraction process.

2) Preparation of *Plumeria alba* (Champa) Flower Extract

The *Plumeria alba* (Champa) flowers were shade-dried at room temperature for 7 to 10 days. After drying, the flowers were ground into a fine powder using a mortar and pestle. The resulting powder was then placed into a conical flask and mixed with an appropriate amount of methanol. The mixture was subjected to Soxhlet extraction for 3 to 4 days using a Soxhlet apparatus, following the standard procedure.

D) Preparation of face serum

1. Disperse Carbopol in Water
- Action: Mix Carbopol with water

2. Allow to Hydrate Overnight
- Action: Let the dispersion rest overnight

3. Add Remaining Ingredients One by One

- Note: Follow the table of ingredients

4. Add Triethanolamine

- Action: Add for desired consistency

Sr. no	Ingredients	F1	F2	F3
1	Water	Q. S	Q. S	Q. S
2	Carbopol 940	0.1g	0.2g	0.3g
3	Triethanolamine	0.1ml	0.1ml	0.1ml
4	Glycerin	7ml	7ml	7ml
5	Tween 80	2ml	2ml	2ml
6	Lemon oil	0.3ml	0.3ml	0.3ml
7	Vitamin E	1ml	1ml	1ml
8	Sodium benzoate	0.1g	0.1g	0.1g
9	Fenugreek extract	3ml	3ml	3ml
10	Champa Extract	2ml	2ml	2ml

E) Evaluation Parameters of the Prepared Anti-Aging Face Serum

1. Organoleptic Evaluation

The serum was assessed for organoleptic characteristics, including color, odor, appearance, texture, and smoothness. Color and texture were evaluated visually and through tactile sensation, respectively. Odor evaluation was conducted by a panel of four healthy faculty members.

2. Appearance and Homogeneity

The appearance and homogeneity of the serum were assessed through visual inspection to ensure uniform consistency and absence of phase separation.

3. Skin Irritation Test

A skin irritation test was conducted by applying the serum to the skin and leaving it for 30 minutes. Any signs of irritation, such as itching, redness, or rashes, were observed using both sensory feedback and visual inspection.

4. PH Determination

For pH measurement, 1 ml of the serum was diluted in 100 ml of distilled water. The resulting solution's pH was measured using standardized pH paper.

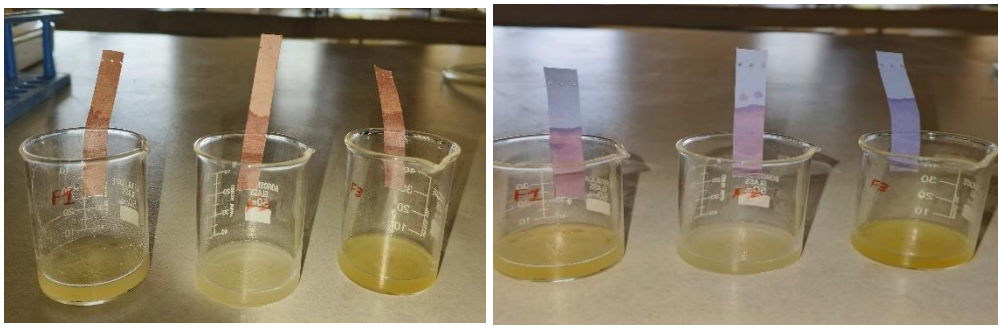


Fig.no.5- pH determination of the samples

5. Viscosity

The viscosity of face serum was determined by using Oswald viscometer.

6. Spread ability

A small quantity of the sample is placed between two glass plates. A known weight is placed on top, and the time taken for the plates to move or separate is recorded.

7. Temperature

The sample is exposed to alternating high and low temperatures (e.g., 4°C and 40°C).One complete cycle = low temp → high temp → back to low temp. Typically conducted for 3–6 cycles.

8. Anti-microbial test

Sample is placed on an agar plate inoculated with microbes. After incubation, the clear zone (no microbial growth) around the sample is measured.

Larger zone = stronger antimicrobial activity.

III. RESULT AND DISCUSSION

PHYTOCHECAL SCREENING FOR FENUGREEK

Phytochemical	Test	Observation	Result
Alkaloids	Wagner's test	Reddish brown precipitate	Positive

Flavonoids	Alkaline reagent test	Yellow coloration	Positive
Saponins	Foam test	Stable foam formation	Positive
Tannins	Ferric chloride test	Dark blue /green coloration	Positive
Phenols	Ferric chloride test	Blue green coloration	Positive
Steroids	Lieberman n-Burchard test	Green ring formation	Positive
Terpenoids	Salkowski's test	Reddish brown coloration	Positive

PHYTOCHEMICAL SCREENING FOR PLUMERIA ALBA

Phytochemical	Test	Observation	Result
Alkaloids	Wagner's test	Reddish brown precipitate	Positive
Flavonoids	Shinoda/alkaline reagent	Pink or red coloration	Positive
Tannins	Ferric chloride test	Blue-black green precipitate	Positive
Saponins	Foam test	Persistent froth	Positive
Glycosides	Keller- Kiliani test	Reddish brown ring at interface	Positive
Terpenoids	Salkowski's test	Reddish brown coloration	Positive
Phenols	Ferric chloride test	Deep blue or black color	Positive
Steroids	Lieberman Burchard test	Green coloration	Positive

3. Physical evaluation of face serum

Sr. No	Evaluation parameter	Formulation
1	Colour	Pale yellow
2	Odour	Citrous
3	Texture	Silky water
4	homogeneity	Good

4. PH determination of the serum incorporated with the extract.

Formulations	PH
F1	4.5
F2	4.9
F3	5.2

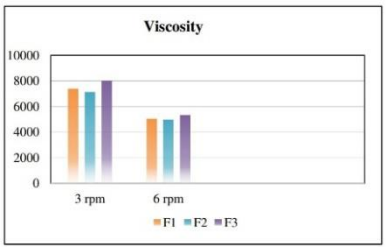
5. Cyclical temperature study.

Parameters	F1	F2	F3
Freeze temperature	Stable	Unstable	Stable
Room temperature	Stable	Stable	Stable
High temperature	Unstable	Stable	Stable

6.Skin irritation test

Skin irritation and sensitization assessments were conducted on the formulated face serum using standardized patch and sensitization tests. The results indicated no visible signs of adverse or allergic reactions, confirming the dermal compatibility of the formulation.

7.Viscosity



8. Spreadabiliy test:

Sr no.	Formulation	Diameter (cm)	Radius (cm)
1	F1	4.8	2.4
2	F2	4.2	2.1
3	F3	3.2	1.6

9.Anti-microbial study :-

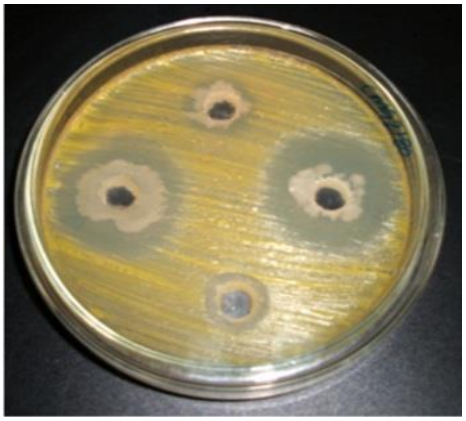


Fig no. 8 – Anti microbial study

IV. CONCLUSION

The formulated face serum incorporating Trigonella foenum-graecum (fenugreek) extract and Plumeria alba extract demonstrated promising potential as a natural anti-aging skincare product. Both plant extracts are rich in bioactive compounds such as flavonoids, polyphenols, and antioxidants, which help in combating oxidative stress—a major contributor to skin aging. Fenugreek extract contributed to skin hydration, firmness, and reduction in fine lines due to its mucilage content and presence of niacin, while Plumeria alba extract offered soothing, anti-inflammatory, and skin-rejuvenating properties.The serum showed acceptable dermal compatibility in preliminary irritation tests (patch and sensitization), with no signs of redness, itching, or inflammation, and maintained an ideal pH range of 4.5–5.0. Thus, the combined botanical formulation supports skin barrier repair, enhances moisture retention, and provides a gentle, natural approach to reducing early signs of aging. Further clinical evaluation and long-term use studies are recommended to validate efficacy and consumer acceptability.

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