

Formulation And Evaluation of Polyherbal Face Serum

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Abstract: This study emphasizes on the formulation and evaluation of a polyherbal face serum using *Clitoria ternatea* and papaya leaf extracts. The serum was prepared using an oil-in-water emulsion technique and evaluated for physicochemical properties, stability, safety, and efficacy. The results demonstrated that the formulation exhibited suitable pH, good viscosity, excellent spreadability, and rapid absorption. Stability studies proved no phase separation, and no skin irritation was observed, specified safety for topical use. The serum showed significant antioxidant, moisturizing, anti-aging, and antimicrobial properties. Among the formulations, F1 was found to be optimal. Overall, the formulated polyherbal serum offers a safe, effective, and eco-friendly alternative to synthetic cosmetic products.

Keywords: Polyherbal serum, *Clitoria ternatea*, papaya extract, antioxidant, antimicrobial, skin care, herbal cosmetics

I. INTRODUCTION

Cosmetics have been used since ancient times for beautification and protection of the skin. The term cosmetics are derived from the Greek word “kosmestikos”, meaning skill in decorating. In modern times, cosmetic science has evolved significantly with advanced research, improved formulations, and better understanding of skin physiology. A growing segment in this field is cosmeceuticals, which combine cosmetic and pharmaceutical benefits. These products not only enhance appearance but also provide therapeutic effects such as anti-aging, hydration, and skin repair^{1,2,18,22}.

Herbal cosmetics have gained tremendous popularity due to their natural origin, safety, and minimal side

effects. They are prepared using plant-based constituents like antioxidants, vitamins, essential oils, and tannins. Ayurveda has long supported the use of herbal ingredients for skincare, making herbal formulations highly relevant today^{17,29}.

The skin is the largest organ of the human body and plays a vital role in protection, sensation, and regulation. Among various cosmetic products, face serums are widely used because they are lightweight, fast-absorbing, and capable of delivering active ingredients deep into the skin^{3,4,5,7}.

Face serums help in: Improving skin texture, Reducing wrinkles and fine line, Hydrating and nourishing the skin, Enhancing skin elasticity, Protecting against environmental damage, However, some disadvantages include possible allergic reactions, high cost, and unsuitability for certain skin types⁶.

A polyherbal face serum combines multiple herbal extracts to enhance effectiveness through synergistic action. This study focuses on the formulation and evaluation of such a serum using *Clitoria ternatea* and papaya extracts.

II. MATERIAL AND METHODS

Materials: All the chemicals and reagents used in the study were of analytical grade. The herbal materials were authenticated by a qualified botanist.

Collection and Authentication of Plant Materials- Plant materials were collected and authenticated by a botanist. They were washed, shade-dried, powdered, and stored in airtight containers^{15,16}.

Preparation of Extracts –

The powdered plant materials (50 g each) were extracted using Soxhlet apparatus with 90% ethanol

for 24 hours. The extract was concentrated at 60–70°C to obtain a semi-solid mass.

Methods of Preparation

Extraction- The herbal extract of (Papaya and Clitoria ternatea) were prepared by Soxhlet extraction followed by filtration and concentration^{10,15}.

Oil Phase Preparation - Lemon oil, sesame oil, vitamin E, and Tween 20 were mixed thoroughly^{7,13}.

Aqueous Phase Preparation - Extracts, glycerine, and rose water were mixed uniformly^{7,15}.

Emulsion Formation (Combination) - Oil phase was added slowly into aqueous phase with continuous stirring^{7,14}.

Addition of Preservative- Sodium benzoate was added^{19,31}.

Final Mixing - Distilled water was added to make the final volume and obtain a uniform serum^{19,26}.

Storage - The serum was stored in amber-colored bottles^{19,26}.

Sr. No.	Ingredients	Category/Function
1.	Clitoria ternatea flowers	Antioxidant, used for skin disorders and skin-brightening properties
2.	Papaya leaves	Rich antioxidant, wrinkle reduction, treatment of pigmentation
3.	Lemon oil	Used for hyperpigmentation and skin brightening
4.	Vitamin E capsule	Antioxidant
5.	Tween 20	Emulsifier, improves texture
6.	Glycerine	Humectant, wound-healing properties
7.	Ascorbic acid	Antioxidant, reduces hyperpigmentation
8.	Sesame oil	Anti-aging, antioxidant, protection against sun damage
9.	Distilled water	Vehicle, used to dissolve active ingredients and maintain product stability
10.	Rose water	Antioxidant, used as a facial cleanser and toner
11.	Sodium benzoate	Preservative with antimicrobial activity

Table 1. List of ingredients and Their Functions Used in Formulation

Extraction Method of Clitoria Ternatea Flowers and Papaya Leaves Using Soxhlet Apparatus

The dried flowers of Clitoria ternatea and papaya leaves were separately ground into coarse powder. About 50 g of each powdered material was extracted with 90% ethanol (300 mL) using a Soxhlet apparatus

for 24 hours^{10,15}. The obtained extract was then filtered and concentrated to dryness at a temperature of 60–70°C¹⁶. The resulting extract was a brownish-blue, semi-solid mass with a yield of approximately 3.5 g. The obtained extract was filtered and collected for further formulation

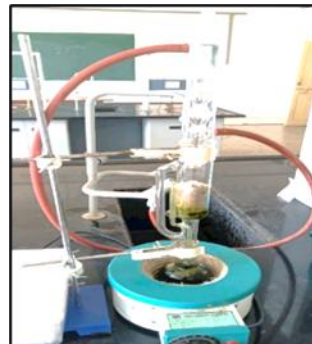


Fig 1: Dried flowers of Clitoria ternatea Fig 2: Powdered Plant Material for Extraction Fig 3: Soxhlet Extraction Apparatus

Preparation of Face Serum:

The oil-in-water (o/w) emulsion was prepared according to the formulation. The oil phase consisting of lemon oil, sesame oil, vitamin E capsule oil, and Tween 20 was mixed in a mortar for 10 minutes using

trituration to obtain a uniform mixture. Simultaneously, the aqueous phase was prepared by mixing Clitoria ternatea flower extract, papaya leaf extract, glycerine, and rose water uniformly. Half of the aqueous phase was separated and allowed to stand

for 10 minutes. The oil phase was then added drop-wise to the aqueous phase with continuous trituration. After each addition, the mixture was triturated continuously until a clicking sound was observed, indicating the formation of a primary emulsion. The remaining aqueous phase was added gradually in small portions with continuous trituration to obtain a

homogeneous product. The emulsion was then transferred to a measuring cylinder, and distilled water was added to make up the final volume to 30 mL. The formulation was mixed thoroughly to obtain a uniform serum. Finally, the prepared serum was filled into suitable containers, tightly closed, and stored appropriately^{10, 12, 15, 1}.

Formulation of Polyherbal Face Serum

Sr. No	Ingredients	Formulation 1	Formulation 2	Formulation 3
1.	Clitoriateratea flowers	6ml	6.2ml	6.4ml
2.	Papaya leaves	20ml	19.4ml	18.9ml
3.	Lemon oil	0.4ml	0.4ml	0.4ml
4.	Vitamin Ecapsule	0.2ml	0.2ml	0.4ml
5.	Tween 20	0.4ml	0.2ml	0.3ml
6.	Glycerine	0.75ml	0.45ml	0.3ml
7.	Ascorbic acid	0.3g	0.8g	0.4g
8.	Sesame oil	0.75ml	0.45ml	0.15ml
9.	Distilled water	qs	qs	qs
10.	Rose water	1ml	1ml	1ml
11.	Sodium benzoate	0.2ml	0.2ml	0.2ml

Table 2: Formulation of Polyherbal Face Serum



Fig 4: Preparation Process of Polyherbal Face Serum

III.EVALUATION PARAMETER OF HERBAL FACE SERUM:

Physical Appearance - Checked for color, odor, and homogeneity. All formulations were smooth and uniform.^{7,9,14}.

pH of the Serum:pH ranged between 4.45 – 4.91. Suitable for skin (normal range: 4.1–6.7)^{8,19,31}.

Phase Separation- indicates stability.^{9,24}.

Skin Irritation Test- No redness or irritation observed after 72 hours → safe for use³³.

Determination of Viscosity - Ranged from 180–240 cps. Indicates good consistency^{7, 33}.

Accelerated Stability Studies - The physical stability of the formulation was evaluated by placing the

samples in a stability chamber at 45°C and 75% relative humidity. Observations were recorded over a period of 2 weeks at intervals of 5 days for any changes in appearance and physical stability^{19,31,32}.

Antimicrobial Assay - Tested against *Staphylococcus aureus*:

Zone of inhibition showed good antimicrobial effect^{20,27}.

Determination of Spreadability - Found to be 5–6 cm. Easy to apply^{11, 21}.

Cyclic Temperature Test - The formulated serum was subjected to cyclic temperature conditions by alternatively storing it at refrigeration temperature ($4 \pm 2^\circ\text{C}$) and room temperature ($25 \pm 2^\circ\text{C}$) for a period of 7-10 cycles (each cycle of 24 hours).

Result:-The formulation remained stable at room temperature, while slight instability was observed at refrigeration conditions. No significant phase separation or change in appearance was observed under normal storage conditions, indicating acceptable stability^{44,54}.

Washability Test- Easily washable without residue.^{10,26}

Moisturizing Property - A corneometer was used to measure the hydration level of the skin before and after

application of the serum, indicating its moisturizing effect^{25, 28}.

Globule Size Determination- The prepared face serum was analyzed under a microscope to determine globule size. A drop of the serum was placed on a glass slide, diluted with water, and observed under a microscope using a stage micrometer^{9,30}.

Homogeneity Test- Homogeneity was evaluated visually by checking for uniformity and absence of phase separation or precipitation. The formulation showed uniform distribution, confirmed by its appearance and texture^{7,9}.

Absorption Time - Absorbed within 1–2 minutes.^{11,23}

IV.RESULT AND DISCUSSION

Sr. No	Parameters	Formulation 1	Formulation 2	Formulation 3
1.	Physical Appearance			
	Colour	Bluish white	white Pale blue	Pale blue
	Odour	Pleasant	Characteristic	Characteristic
	Homogeneity (clarity test)	Good (absence of white and black particles)	Good (absence of white and black particles)	Good (absence of white and black particles)
2.	pH	4.79	4.45	4.91
3.	Phase separation	No	No	No
4.	Skin Irritation test	No	No	No
5.	Determination of viscosity	240cp	220cp	180cp
6.	Washability Test	Washable	Washable	Washable

Table 3: Results of Evaluation Parameters of Polyherbal Face Serum



Figure 5: Various Formulations of Polyherbal Face Serum (F1, F2, F3)

Accelerated stability studies - During stability studies F1 formulation produces good results during 1 month.

Parameter	Observation
Visual appearance	Bluish White
Homogeneity	Good
Phase separation	Nil

Table 4. Accelerated Stability Study of Optimized Formulation F1

Anti-microbial Assay - Anti-microbial activity was tested for the face serum and zone of inhibition is measured. The area around the antibiotic disk that has no bacterial growth is known as the zone of inhibition.



Figure 6: Antimicrobial Activity Showing Zone of Inhibition for Herbal Face Serum (Agar Well Diffusion Method)

Sample (mm)	Zone of Inhibition
Standard	D = 19 mm
Formulation code 1	D = 17.3 mm
Formulation code 2	D = 17.0 mm
Formulation code 3	D = 16.8 mm

Table 5: Antimicrobial Activity (Zone of Inhibition)

Determination of Spreadability:- Spreadability reflects the ease with which the serum can be applied on the skin, ensuring proper dosing. Observed spreadability for the formulations was 5–6 cm, indicating good application properties.

Cyclic Temperature test:

Sr. No	Condition	Observation
1.	Freezer temperature	Unstable
2.	Room temperature	stable

Table 6: Cyclic Temperature Stability Test

Moisturizing Property:

Measurement: Corneometer hydration levels

< 30 A.U. (Very dry skin)

30-45 A.U. (Normal/ Mildly hydrated skin)

>45 A.U. (Well-moisturized/ Hydrated skin)

Studies show that effective serum application can increase hydration for skin. Serum is designed to repair the barrier.

Globule Size determination-Globule size ranged from 0.1–0.3 μm , which enhances penetration into the skin, improving efficacy.

Absorbance time-

The serum began to absorb immediately and was completely absorbed within 120 seconds, consistent with expected values.

After-Feel Evaluation

Subjects reported a soothing and pleasant effect, indicating good emollient and moisturizing properties. No irritation or sensitivity was observed.

V.CONCLUSION

The present study successfully formulated and evaluated a polyherbal face serum using *Clitoria ternatea* and papaya extracts. So it is concluded that the serum showed excellent stability, safety, and effectiveness. It exhibited antioxidant, moisturizing, anti-aging, and antimicrobial properties. No irritation or adverse effects were observed Among all formulations, F1 was optimized. The study concludes that polyherbal face serums are a safe, effective, and ecofriendly alternative to synthetic cosmetic products. With proper formulation, they can significantly improve skin health, hydration, and overall appearance.

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