

**A POLYHERBAL SERUM; INVESTIGATING THE COSMETIC POTENTIAL OF
BUTTERFLY PEA, FLAXSEED AND BEETROOT****Pavithra T.*, Monika Chavan, Nagaveni A. P., Nagushree K. C., Akash P. Gowda, Neha P.**Department of Pharmacognosy, Bharathi College of Pharmacy, Bharathinagara, Maddur Taluk Mandya District-
Karnataka, India – 571422.***Corresponding Author: Pavithra T.**Department of Pharmacognosy, Bharathi College of Pharmacy, Bharathinagara, Maddur Taluk Mandya District-
Karnataka, India – 571422.DOI: <https://doi.org/10.5281/zenodo.17735197>**How to cite this Article:** Pavithra T.*, Monika Chavan., Nagaveni A. P., Nagushree K. C., Akash P. Gowda., Neha P. (2025).
A POLYHERBAL SERUM; INVESTIGATING THE COSMETIC POTENTIAL OF BUTTERFLY PEA, FLAXSEED AND
BEETROOT. European Journal of Pharmaceutical and Medical Research, 12(12), 250–255.

This work is licensed under Creative Commons Attribution 4.0 International license.

Article Received on 01/11/2025

Article Revised on 22/11/2025

Article Published on 01/12/2025

ABSTRACT

Herbal cosmetics are formulations primarily used to protect and maintain a person's appearance. A face serum is a light preparation that contains multiple active ingredients designed to target specific skin concerns and provide various benefits. Most face serums available today are prepared using both synthetic and herbal ingredients; however, they often cause unwanted side effects such as irritation and allergic reactions. The purpose of this research was to prepare and evaluate an herbal face serum for anti-aging, and anti-oxidant using *Clitoria ternatea* (butterfly pea) and aloe vera, improve skin tone using beetroot and improve skin elasticity using flaxseeds as the key ingredient. The herbal face serum was evaluated for several parameters, including pH, viscosity, spread ability, stability, homogeneity, sensitivity and irritancy, phase separation, anti-microbial assay. The results demonstrated that all formulations showed satisfactory outcomes, suggesting that the use of herbs in serum can serve as a safe and effective alternative to harmful chemical-based cosmetics.

KEYWORDS: *Clitoria ternatea*, Beetroot, Flaxseeds, Herbal serum, Antioxidant, Hydration, Antiaging, Skin care.**INTRODUCTION SERUM**

A serum is a highly concentrated cosmetic product widely used in cosmetology, originally developed for professional skincare. It is designed to penetrate deeply into the skin layers and deliver active ingredients effectively. Serums are lightweight, easily absorbed oil- or water-based formulations that spread smoothly on the skin, providing a non-greasy finish. They quickly absorb and reach the deeper layers of the skin due to their intensive formula, which contains a high concentration of active substances.

Face serums deliver essential ingredients to the skin while minimizing the need for harsh chemicals to achieve instant results. A premium-quality serum helps moisturize, soothe, tighten skin, reduce pore size, and enhance hydration. Typically, serums are formulated to provide anti-aging, antioxidant, and anti-inflammatory benefits, making them suitable for all skin types.

Product forms vary based on skin type: gels and liquids are ideal for oily and combination skin; serums and lightweight lotions suit normal to dry skin; and emollient or moisturizing creams are recommended for dry to very dry skin. The high concentration of active ingredients in serums allows them to address cosmetic concerns faster and more effectively than traditional creams.

A serum is characterized by its fast absorption, deep penetration, non-greasy texture, and concentrated formulation. It is generally available as a gel, lightweight lotion, or moisturizing liquid designed to deliver actives deep into the skin. High-quality serums contribute to firmer, smoother skin, reduce pore appearance, and increase moisture levels. Formulations may include active compounds such as topical antibiotics, retinoids, and other specialized ingredients.^[1,2,3]



Figure 1: Serum.

HERE ARE A FEW STEPS FOR HOW TO APPLY A SERUM, IN AN EFFECTIVE WAY

1. Start with a clean face

Proper cleansing and exfoliation prior to serum

application help eliminate sebum, impurities, and toxins that could hinder optimal absorption.^[4]



2. Apply a pea sized amount

A small amount is sufficient. Dispense a few drops into your palm or with a dropper, and lightly massage into the skin.

3. Use gentle circular motions

Apply natural face serums using light circular motions to ensure even absorption of the active ingredients. The tapping technique may also be used as an alternative.

4. Avoid the eye area

Avoid applying serum near the eyes, as the skin there is delicate and easily irritated. After application, wait a few minutes to let it absorb before using moisturizer or makeup.

5. Allow time for absorption

After applying the face serum, give it at least 5 minutes to fully absorb before layering moisturizer or makeup.^[5]

ANTI-OXIDANT

Antioxidants are molecules that neutralize reactive species (e.g., reactive oxygen/nitrogen species) by donating an electron without becoming pro-oxidants themselves. In skin, excess reactive species from UV light, pollution, and inflammation drive lipid peroxidation, DNA/protein damage, mitochondrial dysfunction, and enzyme activation (e.g., MMP-1) that breaks down collagen → photoaging, hyperpigmentation, and impaired barrier. Antioxidants reduce this oxidative stress and help interrupt these cascades.

Butterfly pea petals are unusually rich in polyacylated anthocyanins called ternatins (the vivid blue pigments), plus flavonols (e.g., kaempferol, quercetin glycosides). These compounds show robust in-vitro free-radical scavenging (DPPH/ABTS/FRAP) and reducing power; hot-water extracts (typical cosmetic solvent) often perform best.

How it helps skin mechanisms**1) Direct antioxidant/radical scavenging**

Petal extracts and anthocyanin-rich fractions quench free radicals (DPPH/ABTS) and show strong reducing capacity, consistent with protection against ROS in skin.

2) Anti-inflammatory effects after UV

Topical butterfly-pea gel (5%) reduced TNF- α and caspase-3 expression in UVB-exposed mouse skin markers linked to inflammation and apoptosis in photo-damage.

3) Anti-matrix metalloproteinase (anti-wrinkle pathway)

A 5% *C. ternatea* cream inhibited the UVB-induced rise of MMP-1 (collagenase) and mitigated collagen loss in rat skin supporting a mechanism for preserving dermal collagen.

4) Wound repair support

Standardized leaf extract accelerated wound healing in animal models (faster closure, improved tensile strength), consistent with antioxidant/anti-inflammatory activity aiding tissue repair. (Leaf $\neq$ petal, but relevant for topical biology.)

5) Skin tone & melanogenesis (early data)

In viro, butterfly-pea extracts showed tyrosinase inhibition and anti-melanogenesis activity in B16 melanoma cells, suggesting potential brightening/spot-control benefits (needs clinical confirmation).

6) Moisturizing/functional cosmetic effects (formulation studies)

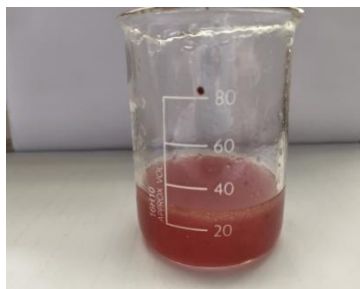
A fermented butterfly-pea extract exhibited measurable moisturizing and whitening effects in cosmetic bench

tests alongside strong radical-scavenging and reducing power. (Instrumental tests on skin surrogates/volunteer panels; not large clinical RCTs.)^[5]

MATERIALS AND METHODOLOGY**Method of Preparation**

- The emulsion (o/w) was prepared according to the formula. The oil component consisting of almond oil, sesame oil and Tween 20 is mixed in a mortar for 10 minutes to obtain a uniform solution.
- At the same time, the aqueous phase was prepared by equally mixing aloe vera gel, clitoria ternatea extract, Beetroot extract, Flax seeds gel, Salicylic acid, Lavender oil, glycerine and Distilled water.
- Then half of the water phase is separated and then the acacia powder is added. Infuse this aqueous phase for 10 minutes.
- The oil phase is added dropwise to the liquid phase by continuous titration. After each addition, rub vigorously without stopping until a click is heard, then emulsions called primary emulsion.
- The remaining aqueous phase is then added in small amounts at a time to obtain a homogeneous product.
- The emulsion is then transferred to a measuring cylinder and more vehicle is added to make a final volume of 30 ml and thoroughly mixed to obtain a uniform emulsion.
- The preparation is applied to the lid of the bottle.

**Dried flowers****Flower with Ethanol****Filter the extract****Beetroot Extract****Oil Phase****Mixing with water phase**



Serum preparation
Figure 2: procedure of serum.

Table 1: Formulation of face serum.

Sl. No	Ingredients	F1	F2	F3	Functions
1.	Clitoria ternatea	4.5ml	5ml	4ml	Anti-oxidant, Anti-aging Skin regeneration
2.	Beetroot	3ml	3ml	2.5ml	Improve skin tone, Reduce pigmentation
3.	Flaxseeds	2.5ml	3ml	2ml	Skin elasticity, Exfoliating
4.	Aloe Vera	13ml	12ml	11ml	Hydrate skin, Reduce acne, Anti- aging
5.	Almond Oil	1ml	1ml	1ml	Moisturizing, Sun damage protection
6.	Sesame Oil	1ml	1ml	1ml	Healing, Anti-bacterial Moisturizing
7.	Glycerine	1ml	1ml	1ml	Humectant, Protect skin barrier, smooth texture, Anti- aging
8.	Tween 20	1ml	1ml	1ml	Emulsifier, Stability
9.	Vitamin E capsule	1ml	1ml	1ml	Fade scars & dark spots
10.	Salicylic acid	0.5gm	0.8gm	0.6gm	Reduce acne, Reduce inflammation, Pore cleansing
11.	Lavender Oil	qs	qs	qs	Kill bacteria, Heal acne & breakout, Unclog pores
12.	Distilled water	qs	qs	qs	Emulsifier, moisturizer

EVALUATION PARAMETERS

1. ORGANOLEPTIC PROPERTIES

The formulations were characterized for organoleptic properties such as colour, odour, consistency and Homogeneity. The formulations are visually inspected for its clarity and presence of any foreign particles.

2. pH OF THE SERUM

pH of is evaluated by pH paper. The skin has an acidic range and the pH of the skin serum should be in the range of 4.1-6.7.

3. PHASE SEPARATION

The prepared preparation was kept in a closed container at room temperature. Phase separation was then checked after 24 hours. Changes in phase separation were observed.

4. SENSITIVITY AND IRRITANCY TEST

Serum was applied to this area and the time was noted. Then, every 2-3 hours, irritation, redness and possible swelling are checked and reported. According to the result, there were no signs of irritation, erythema or swelling in the composition.

5. DETERMINATION OF VISCOSITY

The viscosity of the formulated face serum was determined using an Ostwald viscometer at room temperature ($25 \pm 0.5^\circ\text{C}$). The time taken for the serum to flow between the two marked points of the capillary tube was recorded and compared with the flow time of distilled water, which was used as the reference liquid.

The viscosity of the serum was calculated using the standard formula: where η is the viscosity of the sample, ρ is the density of the sample, and t is the flow time.

$$\eta_Y = \eta_w \frac{d_Y t_Y}{d_w t_w}$$

η_w : viscosity of water
 η_Y : viscosity of tested liquid
 d_w : density of water
 d_Y : density of tested liquid
 t_w : timing of runoff of water
 t_Y : timing of runoff of tested liquid

6. DRUG EXCIPIENTS COMPATIBILITY TEST

In this test to determine the drug excipients compatibility which includes drug as a clitoria ternatea and excipients used in formulation Aloe vera, glycerin, lavender oil, sesame oil, Salicylic acid, tween 20, water, Beetroot extract & Flax seeds. Purpose of Drug-Excipients Compatibility Testing: To ensure no interaction occurs between Clitoria ternatea and the excipients that may affect various factors.

7. SPREADABILITY

The spreadability of Clitoria ternatea serum was evaluated by applying a small quantity of the serum on the clean surface of the forearm skin. The serum was gently spread in a circular motion using the finger without applying excess pressure. The ease with which

the serum spread over the skin surface and the area it covered were observed. The spreadability was assessed based on the smoothness, uniformity, and the time taken to form an even layer. The test was performed at room temperature.

RESULT AND DISCUSSION

Table 2: Result of various evaluation parameters.

Sl.no	Parameters	Formulation 1	Formulation 2	Formulation 3
1.	Organoleptic properties			
i.	Colour	Reddish pink	Reddish pink	Reddish pink
ii.	Odour	Characteristic	Characteristic	Characteristic
iii.	Consistency	Good	Good	Good
iv.	Homogeneity	Good	Good	Good
2.	pH	5.3	5.7	5.1
3.	Phase separation	NO	NO	NO
4.	Sensitivity	NO	NO	NO
5.	Irritancy	NO	NO	NO
6.	Viscosity	1.40cp	1.46cp	1.52cp
7.	Spreadability	Good	Good	Good

pH OF THE SERUM

pH test is performed by using pH paper range in between 4.1-6.7 hence the serum should be acidic range.



Figure 3: pH test of serum.

PHASE SEPARATION

The serum was stored at room temperature and observed for physical stability. No phase separation, precipitation, or visible changes were noted during the study period, indicating that the formulation remained stable at room temperature.

SENSITIVITY AND IRRITANCY TEST

The formulated face serum doesn't show any type of sensitivity reaction. The formulated face serum shows no redness, edema, irritation, or inflammation during studies. The formulated face serum is safe for use.

8. ANTI-MICROBIAL ASSAY

Antimicrobial activity of herbal face serum was done against microbial culture of *Staphylococcus aureus*, by using agar well diffusion method.



Figure 4: Picture of Sensitivity and Irritancy.

DRUG- EXCIPIENTS COMPATIBILITY TEST

Purpose of Drug-Excipients Compatibility Testing: To ensure no interaction occurs between *Clitoria ternatea* and the excipients that may affect.

- Stability
- Efficacy
- Appearance
- Safety

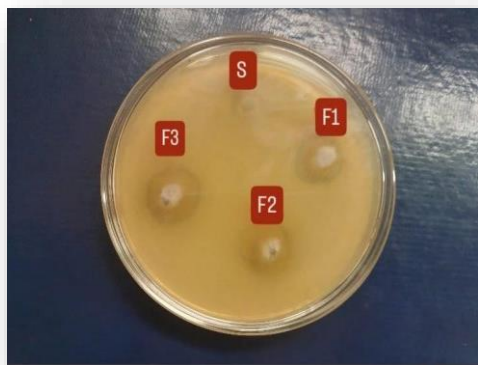
Table 3: Drug- Excipients Compatibility of Formulation F1 to F3.

Sl.no	Excipients	Compatibility with drug Clitoria ternatea
1.	Aloe vera	Good
2.	Beetroot extract	Very good
3.	Flax seeds	Good
4.	Almond oil	Very good
5.	Sesame oil	Good
6.	Lavender oil	Very good
7.	Salicylic acid	Very good
8.	Glycerin	Very good
9.	Tween 20	Good
10.	Water	Good
11.	Vitamin E capsule	Very good

ANTI-MICROBIAL ASSAY

The antimicrobial activity of the formulated face serum was evaluated against *Pseudomonas aeruginosa* using the spreading method. Standard serum was used as the control.

- The formulated serum produced a zone of inhibition measuring [insert mm value].
- The standard serum (control) showed a zone of inhibition of [insert mm value].
- This comparison indicates that the formulated serum exhibits comparable antimicrobial activity to the standard serum.

**Figure 5: Anti-Microbial assay.****Table 4: Zone of inhibition.**

SL.NO	Content	Zone of inhibition
1	Standard	D= 14 mm
2	Formulation 1	D= 17.5 mm
3	Formulation 2	D= 16mm
4	Formulation 3	D= 19mm

CONCLUSION

The aim of the study was to prepare an herbal facial serum using *Clitoria ternatea*, Aloe vera, beetroot, and flaxseeds for facial treatment. *Clitoria ternatea*, which is the main ingredient in the formula, has antioxidant properties for the skin. They slow down the aging of the skin. Aloe vera is another important ingredient with anti-aging and anti-inflammatory properties. Beetroot

improves skin tone. Flaxseeds improve skin elasticity. Almond oil has also been added to protect the skin from sun damage. Sesame oil is used to give the serum an antimicrobial effect. Glycerin soothes the skin. Tween 20 is used as an emulsifier. Salicylic acid used for skin acne. Vitamin E capsule used to Fade scars & dark spots. Lavender oil is used to Kill bacteria, Heal acne & breakout, Unclog pores. A total of three formulations (1, 2 and 3) were prepared by varying the proportion of all ingredients. All three formulations were o/w type emulsions. All dosage forms were free of solid particles. Among the three formulations prepared, Formula 3 was found to be the superior formulation based on its pH, viscosity, homogeneity, irritation and phase separation. Such a stable composition with excellent performance can be attributed to its use.

REFERENCE

1. Smrithi ojha, Surabhi Sinha, Swadhapriya Das Chaudhuri, Hina Chadha, Babhita Aggarwal, Seema Mahor Jain, Ajeet and Meenu. "Formulation and evaluation of face serum contain Bee Venom and Aloe vera gel "World journal of pharmaceuticals research, Edition, 2019; 8(2): PP 1100-1105.
2. Arsha, S. A., Puthanmadathil, B. M., Bilal, M. R., Sivadethu, M. G., & Anuroop, U. P. (2024). Formulation and evaluation of herbal face serum using *Clitoria ternatea*. International Journal of Novel Research and Development, 9(8).
3. 10 Salvioni L, Morelli L, Ochoa E, Labra M, Fiandra L, Palugan L, et al. The emerging role of nanotechnology in skincare. Adv Coll Interface Sci, 2021; 293: 102437.
4. Kumari OS, Rao NB, Gajula RG. Phytochemical analysis & anti-microbial activity of trigonella foenum-gracum (methi seeds). Int Res J Pharm, 2016; 7(6): 83-6.
5. *Clitoria ternatea* anthocyanins (ternatins): Frontiers in Plant Science review (biosynthesis, stability, antioxidant activity).