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FORMULATION AND EVALUATION OF FACE CREAM BY USING *CLITORIA TERNATEA* AND *PSIDIUM GUAJAVA*

Mrs.Rajisha M.B*[1], Fathima.M.Zakeer[2], Binul Fasla[3], Ameesha Prasad[4], Aleena Poly[5]

*[1]Assistant Professor, Department of Pharmaceutics, Indira Gandhi Institute of Pharmaceutical Sciences, Perumbavoor, Ernakulam, Kerala.

[2,3,4,5]VIII Sem B. Pharm, Indira Gandhi Institute of Pharmaceutical Sciences, Perumbavoor, Ernakulam, Kerala.

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***Corresponding Author**

Mrs. Rajisha M.B.
Assistant Professor, Department of Pharmaceutics, Indira Gandhi Institute of Pharmaceutical Sciences, Perumbavoor, Ernakulam, Kerala.

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ABSTRACT

A growing demand for cosmetics made with natural ingredients has increased interest in plant-based substances that offer skin benefits. This study focuses on the formulation and evaluation of a face cream containing extracts of *Clitoria ternatea* flowers and *Psidium guajava* leaves. *Clitoria ternatea* is rich in anthocyanins with strong antioxidant and antiinflammatory properties, while *Psidium guajava* contains bioactive compounds such as flavonoids, phenols, and tannins that exhibit antimicrobial and antibacterial activity, contributing to skin protection. The cream was formulated using suitable emulsifiers, moisturizing agents, and preservatives to obtain a product with acceptable consistency and appearance. The prepared formulations were evaluated for physicochemical properties including appearance, pH, uniformity, spreadability, and skin irritation. The formulated cream showed a smooth, creamy texture, good spreadability, and a pH compatible with normal skin, and was found to be non-irritating. Among the formulations, F3 exhibited good spreadability along with significant antioxidant and antibacterial activity. Overall, the study indicates that the developed face cream is stable, safe for use, and potentially effective in managing skin aging, acne, skin brightening, and protection against oxidative stress and infections.

KEYWORDS: Cosmetics, Skin, Face Cream, *Clitoria ternatea*, *Psidium guajava*, Emulsifying agent.

I. INTRODUCTION

Creams are defined as "viscous liquid or semi-solid emulsions of either the oil-in-water or water-in-oil type" dosage forms which consistency varies by oil and water.[1] Creams are semisolid dosage forms meant for external application to the skin and are commonly prepared as emulsions of oil and water using suitable emulsifying agents. They are smooth, easily spreadable, and cosmetically acceptable. Creams are used in the management of various skin disorders such as aging of skin, acne, bacterial and fungal infections, eczema, dermatitis, allergic reactions, pigmentation disorders, dryness, and scaling conditions. Based on their composition, creams are mainly classified into two types.

i. **Oil-in-Water (O/W) creams:** which are non-greasy, easily washable, and suitable for moist or weeping lesions.

Eg: Vanishing cream

ii. **Water-in-Oil (W/O) creams:** which are greasy and provide better moisturization, making them suitable for dry skin conditions.

Eg: Cold cream

Face cream made with dried butterfly pea flowers and guava leaves it possesses various antiaging, antiacne, antibacterial, antioxidant components. Butterfly pea flower contains rich in anthocyanins which exihibit strong antioxidant and anti inflammatory properties. It plays a significant role in scavenging free radicals, reducing oxidative stress, and protecting the skin from premature aging. Guava leaves contains phenol, tannins, glycosids, flavonoids, terpenoids and alkaloids. These phytoconstituents possess antibacterial and antioxidant activities against both gram-positive and gram-negative microorganisms, contributing to skin protection when applied topically. It also contain full of vitamins B and C. These vitamins are really important for keeping our skin healthy, helping collagen synthesis, and protecting skin from oxidative damage.

The incorporation of butterfly pea flower and guava leaves in face cream provide synergistic formulation aimed at antiaging, antiacne and brightening effect. This synergistic action enhancing skin nourishment, protection and overall appearance.

II. MATERIALS AND METHODS

Figure no 1: *Clitoria ternatea.*

Table no.1: Description of *Clitoria ternatea.*

Synonyms	Blue Pea, Asian Pigeonwings, Butterfly Pea, Bluebellvine.
Biological Source	*Clitoria ternatea* is a perennial, herbaceous climbing plant belongs to family Fabaceae.
Chemical Consistuent	Anthocyanins-delphinidin-3-sophoroside.
Geographical Source	It originates from tropical areas across South & Southeast Asia and Africa.
Uses	Antioxidant, Antiinflammatory, Skin and Hair health, Memory booster, Blood sugar regulation.

Figure no 2: *Psidium guajava* leaves.

Table no.2: Description of *Psidium guajava.*

Synonyms	*Guajava pyrifera*, *Myrtus guajava*, and *Psidium pomiferum*
Biological Source	The entire plant, particularly fruits, leaves, and bark of *Psidium Guajava* belongs to family Myrtaceae
Chemical Consistuents	Flavonoid, Phenol, Glycoside, Tannin, Terpenoids.
Geographical Sources	It originates in the American tropics, spanning Mexico, Central America, and northern South America.
Uses	Antibacterial, Antiacne, Antioxidant, Respiratory and Gastrointestinal issues.

1. COLLECTION OF PLANT MATERIALS

The flowers of *Clitoria ternatea* and leaves of *Psidium guajava* were collected from Cherukunnam, Odakkali, Ernakulam respectively.

2. PREPARATION OF FACE CREAM

2.1 PREPARATION AND EXTRACTION OF *Clitoria ternatea*

The petals and calyx of the flowers were first separated, washed thoroughly, and allowed to dry in open air. They were then placed in a drying cabinet at 40 °C for 24 hours. Once fully dried, it was ground into a fine powder. 145g of the powdered flowers was transferred into a beaker and soaked in 1450 mL of 70% ethanol for three days. After maceration, the mixture was filtered, and the solvent was evaporated using a rotary evaporator at 50 °C. The extract was further concentrated in a water bath at the same temperature to obtain a highly concentrated BPFE.

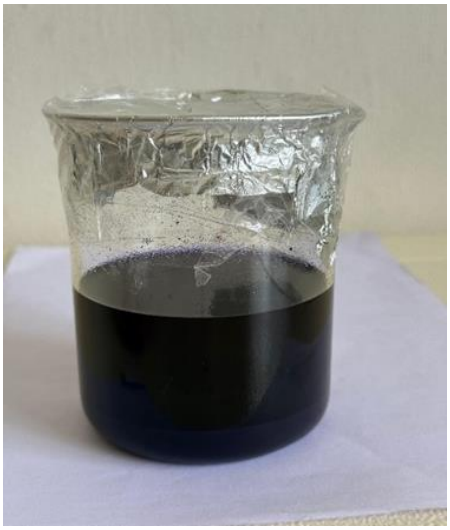

Figure no 3: Maceration of flowers.

2.2 CONFIRMATORY TEST FOR ANTHOCYANIN

Table no. 4: Confirmatory test for anthocyanin.

SI NO.	TESTS	PROCEDURE	OBSERVATION
1.	Sulfuric acid test	1 ml of concentrated H2SO4 added to extract.	Orange colour
2.	Sodium hydroxide test	To the extract add 2 drops of 1N NaoH	Bluish-green colouration

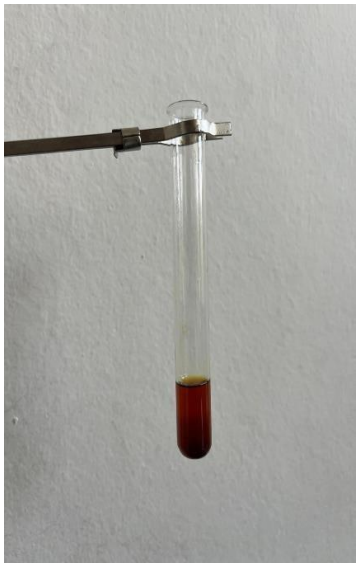

Figure no 4: Sulfuric acid test.

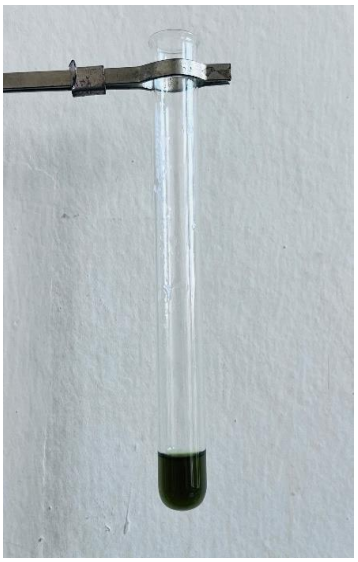

Figure no 5: Sodium hydroxide test.

2.3 PREPARATION AND EXTRACTION OF *Psidium guajava*

The maceration method is used for extraction of *Psidium guajava*. Fresh leaves were first washed thoroughly with distilled water and then air-dried for 3–4 days. After drying, the leaves were ground into a fine powder for further extraction.

The powdered plant material was mixed with 70% ethanol in a ratio of 1:10 (1 g of sample dissolved in 10 ml of solvent). The mixture was kept in a dark place at room temperature for three days to prevent exposure to sunlight. Sterilized beakers wrapped with aluminum foil were used to minimize evaporation.After the maceration period, the mixture was filtered using Whatman No. 1 filter paper. The filtrate was then allowed to evaporate at 37°C to obtain the final extract.

Figure no 6: Maceration of leaves.

2.4 PHYTOCHEMICAL SCREENING OF *Psidium guajava.*

Table no.5: Phytochemical test of *Psidium guajava.*

SI NO:	CHEMICAL CONSISTUENTS	PROCEDURE	OBSERVATION
1.	Phenol	10% $FeCl_3$ were introduced into the sample."	Bluish black colour
2.	Flavonoid	10% NaoH added to the sample	Bright yellow colour
3.	Tannin	10% NaCl and 1% gelatin solutions added to the sample	White precipitate
4.	Terpenoid	Glacial acetic acid and sulphuric acid introduced into the sample	Blue to purple colour
5.	Saponin	Add distilled water into the sample and shaken vigorously	Stable foam
6.	Glycoside	2 ml glacial acetic acid and 2% Fecl3 introduced into the sample and poured this mixture into the 2 ml sulphuric acid	Brown ring at the junction

Figure no 7: Phenol test.

Figure no 8: Flavonoid test.

Figure no 9: Tannin test.

Figure no 10: Glycosides test.

2.5 FORMULATION OF FACE CREAM

Accurately weighed desired quantity of oil components such as Cetosterayl alcohol, white soft paraffin, almond oil, olive oil in a borosilicate glass beaker and heated to 75°C. In a separate beaker take methyl paraben should be dissolve in distilled water and heated to 75°C until produce clear solution. After heating, the aqueous phase was slowly added to the oil phase with continuous stirring until the emulsion began to cool and stabilize. When the temperature of the emulsion reached approximately 40 °C, *Clitoria ternatea* extract and *Psidium guajava* extract were incorporated and mixed thoroughly. Finally, rose oil was added, and stirring was continued until a smooth, uniform cream was obtained.Three different formulation of face cream (F1,F2,F3) were prepared by using different concentration of cetosterayl alcohol as the emulsifying base.

Table no 6: Composition of face cream.

COMPOSITION OF FACE CREAM	F1	F2	F3
Clitoria ternatea(ml)	1.5	1.5	1.5
Psidium guajava(ml)	2.5	2.5	2.5
Cetosterayl alcohol(g)	**4.68**	**5 .15**	**6.12**
White soft paraffin(g)	6.56	6.56	6.56
Almond oil(ml)	7.5	7.5	7.5
Olive oil(ml)	7.5	7.5	7.5
Methyl paraben(g)	0.001	0.001	0.001
Distilled water(ml)	q.s	q.s	q.s
Rose oil(ml)	q.s	q.s	q.s

Figure no 11: Face cream.

2.6 EVALUATION OF FACE CREAM

Physical Evaluation

A. Color: The cream's color was assessed by visual observation.

B. Odor: The odor was evaluated by smelling.

C. State: The appearance of the cream was checked visually.

D. Consistency: The consistency was determined by manually rubbing the cream on the hand.

pH Measurement

A 0.5 g sample of the cream was dissolved in 50 mL of distilled water, and the pH was measured using a digital pH meter

Spreadability

A small amount of cream was placed on a glass slide, and another slide was placed on top. A standard weight was applied to ensure uniform spreading. After removing the weight, excess cream was scraped off. The upper slide was allowed to slide freely under the influence of a tied weight, and the time for separation was recorded. Spreadability was calculated as.

Spreadability=(m×l) / t

Where:

- m = standard weight applied (30 g)
- l = length of slide (5 cm)
- t = time taken for slide to slip (seconds)

Phase Separation

The cream was stored in a sealed container at room temperature, away from sunlight, and observed for 24 hours for any phase separation.

Washability

A small amount of cream was applied to the hand and rinsed with tap water.

Greasiness

The greasiness or oiliness of the cream was evaluated.

Antioxidant Activity

The antioxidant potential was measured using the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. A 0.7 mL DPPH solution (0.4 mM) was added to a 5 mL volumetric flask and diluted with ethanol to 5 mL. The mixture was shaken and left in the dark for 30 minutes, and its absorbance at 516 nm was recorded as the control.

A 10 mg cream sample was dissolved in 10 mL ethanol, centrifuged for 10 minutes, and the supernatant was diluted to prepare different concentrations. Each solution (5 mL) was mixed with 0.7 mL DPPH and ethanol to 5 mL, left in the dark for 30 minutes, and absorbance was measured at 516 nm.

Antibacterial Activity

The antibacterial effect was tested using the well diffusion method on nutrient agar. Wells were made in the agar and filled with 100 µL and 200 µL of gel. Positive and negative controls were added in separate wells. After 15–30 minutes for diffusion, plates were incubated at 37℃ for 18–24 hours, and zones of inhibition were measured.

3. RESULTS AND DISCUSSION

1. **Physical evaluation:-** The physical characteristics of face cream formulations F1, F2, and F3 were evaluated. All three formulations exhibited a deep purple-brown color with a pleasant odor. Visually, the creams were semi-solid, and their consistency was smooth.
2. **pH Measurement:-** The pH values of F1, F2, and F3 were 6.20, 6.47, and 6.48, respectively, which are close to the natural skin pH, indicating that the formulations are safe for topical application.

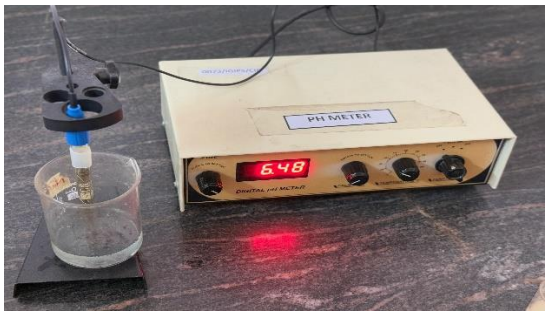

Figure no 12: pH meter.

3. **Spreadability:-** Spreadability testing revealed that F3 had the highest spreadability (1.0), followed by F1 (0.83) and F2 (0.66), suggesting that F3 spreads more easily on the skin.

Figure no 13: Spreadability.

4. **Phase separation:-** No phase separation was observed in any formulation during storage at room temperature, demonstrating good physical stability.
5. **Washability:-** Washability tests indicated that all three formulations could be rinsed off, with F3 being the easiest to remove.
6. **Greasiness:-** The greasiness of all three formulations was slight, giving a smooth texture without excessive oiliness.

Table no 6: Evaluation of face cream.

SI NO.	EVALUATION PARAMETERS	OBSERVATION
1.	Colour	Deep purple brown
	Odour	Pleasant
	Consistency	Smooth
2.	pH measurement	6.48
3.	Spreadability	1.0
4.	Phase separation	Nil
5.	Washability	Easily washable
6.	Greasiness	Slightly greasy

Antioxidant Activity

The antioxidant potential of the face cream was assessed using the DPPH radical scavenging assay. The formulations showed 50% activity, classifying them as strong antioxidants according to the IC50 scale. Based on IC50 values, antioxidant activity is categorized as follows: values below 50 ppm are considered very strong, 50–100 ppm as strong, 100–150 ppm as moderate, and 150–200 ppm as weak.

Antibacterial Activity

Formulation F3 was evaluated for antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* using the well diffusion method. It produced zones of inhibition measuring 1.4 cm and 1.2 cm, respectively, demonstrating significant antibacterial activity comparable to the standard extract.

Table no 7: Anti-bacterial activity.

SAMPLES	ZONE DIAMETER	
	S. aureus	***E coli***
	100 microlitre	**100 microlitre**
F3	1.4 cm	1.2 cm
Extract	1.6 cm	1.4 cm

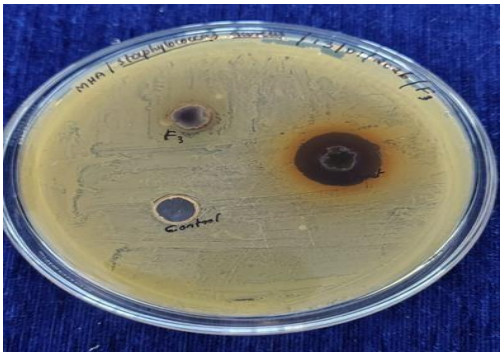

Figure no 14: *Staphylococcus aureus.*

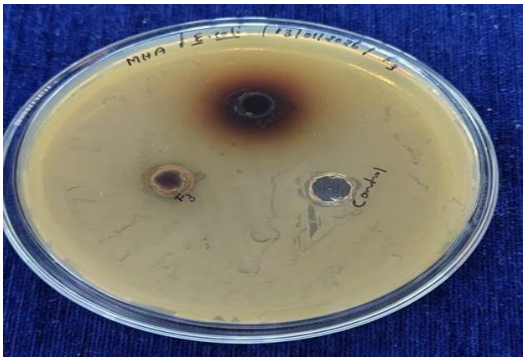

Figure no 15: *E. coli.*

4. CONCLUSION

This study successfully formulated and evaluated a face cream incorporating extracts of *Clitoria ternatea* flowers and *Psidium guajava* leaves. The developed formulations demonstrated acceptable physicochemical properties, including suitable pH, good homogeneity, adequate spreadability, and an appealing appearance. All formulations were found to be stable and non-irritating, indicating their safety for topical application. Among the tested formulations, F3 showed the most favorable performance, exhibiting superior spreadability along with notable antioxidant and antibacterial activities. These beneficial effects are likely associated with the presence of bioactive compounds such as anthocyanins, flavonoids, phenolic compounds, and tannins present in the plant extracts.Overall, the results suggest that the formulated face cream is safe and holds promising potential as a natural cosmetic product for skin protection, anti-aging benefits, acne management, and skin brightening. However, further investigations, including long-term stability studies and clinical evaluations, are recommended to validate its efficacy and support its potential commercialization.

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