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FROMULATION AND EVALUATION OF HERBAL ANTIMICROBIAL CREAM OF *CLITORIA TERNATEA* FLOWER

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KEYWORDS

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Abstract

The present study focuses on the formulation and evaluation of an antimicrobial cream containing extract of *Clitoria ternatea* flower. Herbal formulations have gained significant attention due to their safety, effectiveness, minimal side effects, and natural origin. *Clitoria ternatea* is well known for its antimicrobial, antioxidant, anti-inflammatory, and wound-healing properties because of the presence of phyto-constituents such as flavonoids, tannins, alkaloids, glycosides, and anthocyanins. The aim of the study was to develop a stable and effective topical antimicrobial cream using *Clitoria ternatea* flower extract and to evaluate its pharmaceutical parameters. The antimicrobial cream was prepared by using suitable ingredients such as stearic acid, cetyl alcohol, glycerin, triethanolamine, preservatives, and purified water by the oil-in-water (O/W) emulsification method. The prepared formulation was evaluated for various physicochemical parameters including color, odour, appearance, homogeneity, pH, spreadability, washability, viscosity, stability, and antimicrobial activity. The pH of the cream was found to be compatible with skin pH, indicating suitability for topical application. The formulation showed good consistency, smooth texture, and satisfactory spreadability without causing irritation. The study concludes that *Clitoria ternatea* flower can be effectively incorporated into a topical cream formulation with good antimicrobial potential and acceptable pharmaceutical properties.

INTRODUCTION [1, 2]

An antimicrobial cream is a semisolid topical formulation designed to inhibit or destroy the growth of microorganisms on the skin. These creams are applied externally to prevent microbial contamination and promote healing of infected or damaged skin. Antimicrobial creams generally contain active ingredients with antibacterial, antifungal, or antiseptic properties incorporated into a suitable cream base. Compared to oral therapy, topical antimicrobial preparations provide localized action, reduced systemic side effects, better patient compliance, and direct delivery of the drug at the site of infection.[3,4]

The present study focuses on the formulation and evaluation of an antimicrobial cream containing extract of Clitoria ternatea flower. *Clitoria ternatea*, commonly known as Butterfly Pea, belongs to the family Fabaceae and is widely used in traditional Ayurvedic medicine. The plant is well known for its medicinal properties such as antimicrobial, antioxidant, anti-inflammatory, wound-

healing, and skin-protective activities. The flowers are rich in anthocyanins, flavonoids, tannins, and phenolic compounds which contribute to its therapeutic effectiveness against various microorganisms.[5]

The flower extract of *Clitoria ternatea* has shown potential antimicrobial activity against several pathogenic microorganisms responsible for skin infections. Due to these medicinal benefits, the plant has gained attention in the development of herbal cosmetic and pharmaceutical preparations. Incorporation of *Clitoria ternatea* flower extract into a topical cream formulation May provide effective protection against microbial growth while maintaining skin health and reducing irritation.

What is a Microbial Infection?

A microbial infection refers to an infection caused by harmful microorganisms such as bacteria, fungi, viruses, or parasites that invade the body or skin and multiply, leading to disease or irritation. These infections can affect different parts of the body including the skin, wounds, respiratory tract, digestive system, and mucous membranes.

MATERIAL AND METHODS

Collection of drug:

Clitoria ternatea flower is commonly known as butterfly pea flower and belongs to the family Fabaceae. The flowers are deep blue, purple, or white in color and possess a characteristic odor with a slightly bitter taste. The flower has a soft texture and butterfly-like appearance. Microscopically, the flower shows compact epidermal cells, multicellular trichomes, vascular bundles, and anthocyanin-containing pigmented cells.

Fig no.1 *Clitoria Ternatea* Flower

Clitoria ternatea L. is a well-known medicinal flowering plant belonging to the family Fabaceae, commonly known as the legume family. The plant is popularly referred to as Butterfly Pea, Blue Pea, Aparajita, and Gokarna in different regions. In botanical literature, it is also known by synonyms such as *Clitoria ternatea.*

MATERIALS:

Table no. 1 Ingredients & their Role

Sr. No .	Ingredients	Role
1	Stearic Acid	thickening agent and emollient.
2	Bees wax	stiffening agent and emulsifier.
3	Propyl parabean	preservative
4	Methyl parabean	preservative
5	Propylene glycol	humectant, penetration enhancer

6	Triethanolamine	emulsifying agent and pH adjuster
7	Coconut oil	emollient and moisturizing agent.

Preparation for Extraction:

The dried powder of flowers of Clitoria ternatea was used for extraction of active constituents. The extraction method is carried out by Maceration method. Then Clitoria ternatea powder was extracted with ethanol and water. 40g of above sited powder was taken in closed tight container. Extract with 500 ml ethanol. Then filter it out by using whatmann filter paper.

Phytochemical Screening:

1) Test for Alkaloid:

Dragendroff's Test

Dragendorff's test is a qualitative chemical test used for the identification of alkaloids in a sample. In this test, the addition of Dragendorff's reagent to the test solution produces an orange precipitate, which confirms the presence of alkaloids.

2) Flavonoid test:

Shinoda Test

Shinoda test is a qualitative chemical test used for the identification of flavonoids in a sample. In this test, the addition of magnesium turnings and concentrated hydrochloric acid to the extract produces a red color, which confirms the presence of flavonoids.

3) Flavonoid Alkaline Test:

The alkaline reagent test was performed for the identification of flavonoids in the formulation. In this test, a small quantity of the cream extract was treated with sodium hydroxide solution, which produced an intense yellow color.

4) Tannin Test:

The tannin test was performed for the identification of tannins in the sample. In this test, a few drops of ferric chloride solution were added to the extract, and the formation of a greenish-black color confirmed the presence of tannins.

5) Saponin Test:

The saponin test was performed for the identification of saponins in the sample. In this test, the extract was shaken vigorously with distilled water, and the formation of stable persistent foam confirmed the presence of saponins. Formulation of herbal cream

Phytochemical analysis:

Phytochemical screening was performed to identify the major bioactive constituents present in the ethanolic extract of *Clitoria ternatea* flowers. The presence of these phytochemicals is responsible for the antimicrobial and therapeutic properties of the formulated herbal cream.

Preparation of cream:

1. Semi-solid Crude Extract Obtained
2. Preparation of Oil Phase (Stearic acid + Beeswax + Coconut oil heated at 70–75°C)
3. Preparation of Aqueous Phase (Water + Propylene glycol + Preservatives heated at 70–75°C)
4. Mixing of Phases (Add aqueous phase into oil phase with continuous stirring)
5. Addition of Plant Extract
6. Final Cooling at Room Temperature
7. Packaging in Sterile Container

Table no. 2 Formulation Table

Sr. No.	Ingredients	Batch F1	Batch F2	Batch F3	Batch F4	Batch F5

1	Clitoria ternatea	0.50 g	1.00g	1.50 g	2.00 g	2.50 g
2	Stearic Acid	1.5 g	1.50 g	1.50 g	1.50 g	1.50 g
3	Bees wax	0.80 g	0.50 g	0.50 g	0.50 g	0.50 g
4	Propyl parabean	0.02 g	0.02 g	0.02 g	0.02 g	0.02 g
5	Propylene glycol	1.00 g	1.00 g	1.00 g	1.00 g	1.00 g
6	Triethanolamine	0.20 g	0.20 g	0.20 g	0.20 g	0.20 g
7	Coconut oil	2.00g	2.00 g	2.00g	2.00 g	2.00 g
8	Water	3.98 (qs)	3.78 (qs)	3.28 (qs)	2.78 (qs)	2.28 (qs)

Evaluation parameters:

1) Physical Appearance:

The physical appearance of the antimicrobial cream was evaluated by observing its color, odor, texture, and overall consistency.

Color: The color of the cream was checked by visual observation under normal daylight or white light background**.**

Odour: The odour of the cream was evaluated by sensory evaluation (smelling method)**.**

Consistency: The consistency of the cream was assessed by tactile examination**.**

2) Measurement of pH:

The pH meter was calibrated using standard buffer solutions of pH 4.0, 7.0, and 9.2 to ensure accuracy. A small quantity of the cream was then accurately weighed and dispersed in a measured amount of distilled water to form a uniform suspension. The electrode of the pH meter was rinsed with distilled water and gently blotted dry before immersion into the sample solution. The electrode was then dipped into the prepared dispersion, and the reading was allowed to stabilize.

3) Spreadability: The spreadability of the cream was determined by measuring the time required for two glass slides to slide over each other when a cream sample was placed between them under a specific weight. A fixed amount of cream was placed on one glass slide, and another slide was placed over it. A known weight was applied on the upper slide to form a uniform layer of cream. The time taken for the upper slide to move a fixed distance over the lower slide was recorded.

Spreadability (S) was calculated using the formula:

S = (M × L) / T

Where:

- **S** = Spreadability
- **M** = Weight tied to the upper slide
- **L** = Length of glass slide moved
- **T** = Time taken to separate the slides

4) Homogeneity:

The homogeneity was evaluated by visually examining the formulation after preparation to ensure uniform distribution of all ingredients. A small quantity of cream was spread on a glass slide and observed for the presence of any lumps, aggregates, or phase separation.

5) Stability Test:

The stability of the cream was evaluated to determine its physical integrity and performance under different storage conditions. The formulated cream was stored at various temperature conditions such as room temperature, refrigeration temperature, and elevated temperature for a specific period of time. The samples were periodically observed for any changes in color, odour, consistency, phase separation, or precipitation.

6) Irritancy Test:
The irritancy test is an important evaluation parameter used to determine whether the formulated cream causes any skin irritation such as redness, swelling, itching, or inflammation after application.

8) Washability Test:
The washability test was performed to evaluate the ease with which the formulated antimicrobial cream can be removed from the skin surface using normal tap water. This parameter is important for topical formulations as it reflects user convenience, cleanliness, and patient compliance during routine application.

9) Phase Separation Test:
The phase separation test is performed to determine the physical stability of a cream formulation by checking whether the oil phase and aqueous phase remain uniformly mixed or separate over time under different storage conditions.

10) Zone of Inhibition test:
The zone of inhibition of the antimicrobial cream was determined by the agar well diffusion method. After incubation of the inoculated agar plates, a clear circular area was observed around the sample application site, which indicated inhibition of microbial growth. The diameter of the zone of inhibition was measured in millimeters and used to evaluate the antimicrobial effectiveness of the formulated cream. A larger zone of inhibition indicated higher antimicrobial activity of the prepared formulation. The antifungal activity of the prepared antimicrobial cream was evaluated against Candida albicans by measuring the zone of inhibition using the agar diffusion method.

RESULTS:

Table no. 3 Phytochemical analysis of extract

Sr. no	Test	Observation	Inference
1	Alkaloid	Orange color is observed	Alkaloid is present
2	Flavonoid	Reddish brown precipitate was observed	Flavonoid is present
3	Flavonoid Alkaline	Yellow color precipitate was observed	Flavonoid is present
4	Tannin	Greenish black precipitate observed	Tannin is present
5	Saponin	Foam was formed	Saponin is Present

Evaluation of herbal Cream

Physical Evaluation of cream

The physical appearance of the antimicrobial cream was evaluated by observing its color, odor, texture, and overall consistency.

Table no. 4 Physical Evaluation of cream

Formulation	Color	Consistency	Odour
F1	**Dark green color**	**Poor**	**Characteristic**
F2	**Green colour**	**Moderate**	**Characteristic**
F3	**Green color**	**Smooth**	**Characteristic**

F4	**Green color**	**Good**	**Characteristic**
F5	**Green color**	**Moderate**	**Characteristic**

Measurement of pH

The pH meter was calibrated using standard buffer solutions of pH 4.0, 7.0, and 9.2 to ensure accuracy.

Table no. 5 Measurement of pH

Formulation	pH
F1	4.3
F2	4.5
F3	**6.4**
F4	5.2
F5	5.5

Spreadability Test

Formula

S = (M × L) / T

Where:

- **S** = Spreadability
- **M** = Weight tied to the upper slide
- **L** = Length of glass slide moved
- **T** = Time taken to separate the slides

Calculation

S = 50× 6/5 = 60 g.cm/sec

Result

Spreadability = 60 g.cm/sec

Observation

The formulated 10 g herbal antimicrobial cream showed good spreadability and smooth application on the glass slide.

Table no.6 Washability Test

Formulation	Observation
F1	**Easily Washable**
F2	**Easily Washable**
F3	**Easily Washable**
F4	**Easily Washable**
F5	**Easily Washable**

Table no.7 Phase Separation Test

Formulation	Observation
F1	**No Phase Separation**
F2	**No Phase Separation**
F3	**No Phase Separation**
F4	**No Phase Separation**
F5	**No Phase Separation**

Table no. 8 Irritancy Test

Sr. No	Parameter	Observation

1	**Irritation**	**No**
2	**Mild Dryness**	**Yes**
3	**Swelling**	**No**
4	**Itching**	**No**
5	**Redness**	**No**

Determination of Zone of Inhibition:

Antimicrobial study Method: Zone of inhibition

Materials and methods:

Method: Zone of Inhibition (Agar Well Diffusion Method)

Media:

For bacterial culture: Nutrient Agar (NA)

For fungal culture: Sabouraud Dextrose Agar (SDA)

Culture Used

Bacterial cultures: *Staphylococcus aureus* and *Escherichia coli*

Fungal culture: Candida albicans

Incubation Temperature & time

For bacteria: 37°C for 24 hours

For fungus: 25–28°C for 48 hours

Standard Drug: Streptomycin, Fluconazole

Results and conclusion:

The antimicrobial activity of herbal cream containing *Clitoria ternatea* flower extract was evaluated for five formulations (F1–F5) against *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans* using the agar well diffusion method. All formulations showed antimicrobial activity in a concentration-dependent manner. The zone of inhibition increased from F1 to F3, indicating improved activity with increasing extract concentration. However, after F3, a slight decrease in activity was observed in F4 and F5.

Table no. 9Antimicrobial activity result

Batches	**Extract %**	***S. aureus* (mm)**	***E. coli* (mm)**	***C.albicans* (mm)**
F1	1%	9–10 mm	7–8 mm	8–9 mm
F2	2%	12–14 mm	10–12 mm	11–13 mm
F3	5%	17–18 mm	15–16 mm	16–17 mm
F4	7%	16–17 mm	14–15 mm	15–16 mm
F5	10%	15–16 mm	13–14 mm	14–15 mm

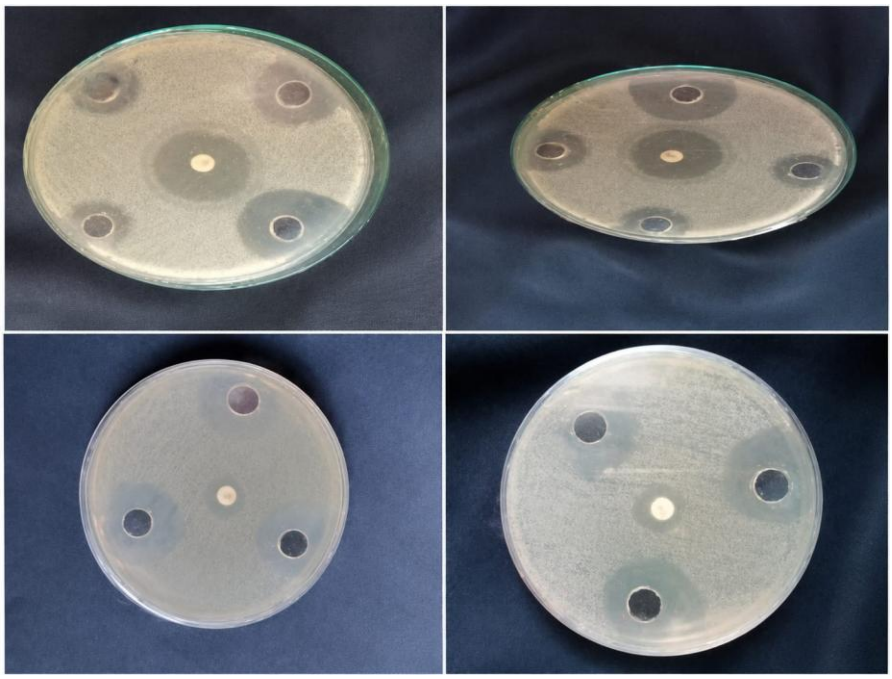

Fig no. 2: Zone of inhibition

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DISSCUSION:

The present study focused on the formulation and evaluation of an antimicrobial cream containing Clitoria ternatea flower extract. Herbal formulations have gained considerable attention due to their safety, effectiveness, and reduced side effects compared to synthetic antimicrobial agents. The incorporation of Clitoria ternatea flower extract into a topical cream formulation was undertaken to explore its potential as a natural antimicrobial agent. Preliminary phytochemical screening of the flower extract revealed the presence of flavonoids, tannins, phenolic compounds, alkaloids, saponins, and glycosides. These phytoconstituents are known to exhibit antimicrobial and antioxidant activities. The presence of these bioactive compounds supports the traditional medicinal use of Clitoria ternatea and may be responsible for the observed antimicrobial effect of the formulated cream. The cream formulation exhibited satisfactory physicochemical characteristics, including smooth texture, homogeneity, acceptable consistency, and good appearance. No evidence of phase separation or grittiness was observed, indicating successful emulsification and compatibility of the formulation ingredients. The pH of the cream was found to be within the acceptable range for topical application, suggesting minimal risk of skin irritation and good patient acceptability. Evaluation of spreadability and extrudability demonstrated that the formulation could be easily applied to the skin and readily dispensed from the container. These properties are essential for ensuring uniform application and enhancing patient compliance. The washability study further confirmed the suitability of the cream for topical use. The antimicrobial activity of the formulated cream demonstrated significant inhibitory effects against selected microbial strains. The observed antimicrobial activity may be attributed to the synergistic action of flavonoids, phenolic compounds, and

tannins present in the Clitoria ternatea flower extract. These phytochemicals are reported to disrupt microbial cell walls, interfere with cellular metabolism, and inhibit microbial growth. Similar findings have been reported in previous studies evaluating the antimicrobial potential of Clitoria ternatea extracts. Stability studies conducted under different storage conditions indicated that the formulation remained physically stable throughout the study period. No significant changes were observed in color, odor, pH, consistency, or overall appearance. These findings suggest that the formulated cream possesses adequate stability and maintains its quality during storage. Overall, the results of the present investigation indicate that Clitoria ternatea flower extract can be effectively incorporated into a cream base and exhibits promising antimicrobial activity. The developed formulation demonstrated satisfactory physicochemical properties, good stability, and effective antimicrobial potential. Therefore, the antimicrobial cream containing Clitoria ternatea flower extract may serve as a safe and effective herbal topical preparation for the management of microbial skin infections. Further clinical studies are recommended to establish its therapeutic efficacy and long-term safety in human subjects.

CONCLUSION:

From the present study, it was concluded that the antimicrobial cream containing extract of Clitoria ternatea flower was successfully formulated and evaluated by using suitable pharmaceutical excepients. The prepared cream exhibited satisfactory physical and physicochemical properties such as smooth texture, good consistency, elegant appearance, homogeneity, ease of application, good spreadability, and easy washability, which indicate patient acceptability and suitability for topical administration. The pH of the formulation was found to be near to the normal skin pH, showing that the cream is safe and compatible for skin application without causing irritation or damage to the skin surface. The antimicrobial activity study performed by zone of inhibition method demonstrated that the formulated cream possesses effective antimicrobial activity against selected microorganisms. The study supports the use of natural herbal ingredients in cosmetic and pharmaceutical preparations due to their safety, effectiveness, economical nature, and reduced side effects compared to synthetic agents.

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