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FORMULATION AND EVALUATION OF ANTI-BACTERIAL CREAM CONTAINING *Lantana camara*

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ABSTRACT

The present study focuses on the formulation and evaluation of an antibacterial cream containing *Lantana camara* leaf extract, a medicinal plant known for its antimicrobial properties. The leaves are rich in bioactive constituents such as flavonoids, alkaloids, tannins, triterpenoids, saponins, and phenolic compounds responsible for antibacterial activity. The extract was incorporated into a suitable cream base and evaluated for physicochemical parameters including pH, viscosity, spreadability, homogeneity, appearance, stability, and antimicrobial activity against selected bacterial strains. The results indicate that the formulated cream exhibited significant antibacterial activity along with acceptable physicochemical characteristics. The study suggests that *Lantana camara*–based cream may serve as a promising natural alternative to synthetic antibacterial formulations with improved safety and therapeutic potential.

KEYWORDS: *Lantana camara*, Lantana cream, antibacterial activity.

1. INTRODUCTION

Human being used plants parts as a phytomedicine since ancient times. Plant is important for bioactive constituents as primary and secondary compounds. Il has been found that secondary metabolites both chemically and taxonomically are exceptionally different compound. These metabolites used in many areas like human therapy, agriculture, scientific research, veterinary, and many other areas. They are largely used in the human therapy, agriculture, scientific research, veterinary, and many other areas. According to the World Health Organization (WHO), about 80% of individuals from developed countries use the traditional medicine as a source if potential and powerful drugs that are derived from medicinal plants. Creams are primarily defined as either semi-solid emulsion of oil and water used in skincare for hydration and medication. Herbal formulation always has attracted considerable attention because of their good activity and comparatively lesser or nil side effects with synthetic drug. Herbal cosmetics are defined as the beauty products which physiological activity such as healing, smoothing appearance, enhancing and conditioning properties because of herbal ingredient. The herbs should have varieties of properties like antioxidant, anti- inflammatory, antiseptic, emollient, antiviral activity and antibacterial activity etc. Cosmetics are developed to reduce wrinkles fight acne and to control oil secretion. A natural skin cosmetic should moisturize, hydrate and nourish the skin.[1] The rate of skin infections due to bacterial and fungal organisms is on the increase.

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Herbal cream

Herbal creams are topical semisolid formulations that incorporate biologically active compounds derived from medicinal plants. They are designed for cutaneous application to deliver phytochemicals such as alkaloids, flavonoids, terpenoids, tannins, and phenolic compounds directly to the skin, where they exert therapeutic, protective, or restorative effects. Cream is a preparation used for the application to the skin. Creams are also applied to the mucus membrane such as vagina, rectum. Creams may be considered as pharmaceutical products and cosmetics used in variety of skin conditions.[19,20] Now a days herbs are widely used as remedial agents because herbs are easily available at less expensive and non-toxic. So, the people have good faith in such remedies. This herbal formulation produces cleansing and beautifying effects and improves overall appearance when rubbed, poured, sprayed externally or applied to body parts.

2. MATERIALS AND METHODS

2.1. Plant collection and authentication

Fresh plant *Lantana camara* was collected from Thirumittakode, Palakkad, Kerala. The freshly collected plant was authentified and certified by Sree Neelakanta Govt. Sanskrit College, Pattambi, Palakkad, Kerala – 679306. The specimen of *Lantana camara* was preserved at herbaria for future reference.

Fig. No. 1: *Lantana camara.*

2.2. Drying and coarse powdering

The collected leaves were thoroughly washed under running tab water. followed by rinsing with distilled water to eliminate dirt, dust, microbial contaminants. The cleaned leaves wee then shade dried at ambient temperature (25℃ - 30℃) for 7-10 days to prevent thermostable phytoconstituent. Once dries, the leaves were ground into a fine powder using a mechanical grinder and stored in an air tight container.

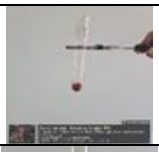
2.3. Preparation of Extracts Soxhlet extraction

Using a porous bag or "thimble" made of cellulose or sturdy filter paper, a finely ground material is placed within the thimble chamber of the Soxhlet apparatus. Heated in the bottom flask, the extraction solvents evaporate into the sample thimble, condense in the condenser, and then drip back. The procedure is repeated after the liquid content reaches the siphon arm and empties into the bottom flask once more. The *Lantana camara* leaves collected weighed (100gm), cut into a small piece, The small pieces of lantana camara leaves are add into the thimble apparatus and add (1000ml) ethanol in a round bottom flask. Then the willow bark powder was mixed with 300ml of methyl alcohol. Set up for Soxhlet apparatus for extraction. And started to boil up to 40oc. The set up Soxhlet apertured for 6 to 7 cycles repeatedly until the complete extraction was done. Content was filtered out; filtrate was allowed to evaporate in evaporating pan until the desired concentration of extract was obtained.

Fig No. 2: Soxhlation of *Lantana camara* leaves.

2.4. Phytochemical screening of *Lantana camara* leaf extract

Table No: 1.

Experiment	Observation	Inference
Test for Flavonoids Shinoda test: Add small Mg ribbon + few drops of con. HCl to extract.		Present
Test for Terpenoids Salkowski Test: The extract 5ml is mixed with 2ml chloroform and this 3ml con. H2SO4 is added.		Present
Test for Alkaloids A. Dagandroff's test: Add Dagandroff's reagent to plant extract.		Present
B. Mayer's test: Add Mayer's reagent to plant extract.		Present

2.5. Preparation of cream

Base cream contains water and oil phases. The compositions and amounts of the formulation ingredients are shown in Table-4. In order to prepare the cream, different amount of ingredients was incorporated together, then the required amount of the herbal extract was added.

Preparation of oil phase

Weigh mentioned amount of stearic acid, cetyl alcohol, white soft paraffin and liquid paraffin and neem oil melt in a beaker at 70- 75 ℃ on water bath.

Preparation of aqueous phase

Heat distilled water to 70-75℃.Glycerin, propylene glycol, methyl paraben and propyl paraben are dissolved in warm water along with plant extract and aloe vera. Take out beaker from water bath and add triethanolamine slowly with stirring.

Preparation of cream

Transferred the aqueous phase in to oil phase under continuous stirring condition using an electrical stirrer.

Prepared lantana cream formulation was stored in an amber colored glass container until further use.

Table No. 2.

Sl No	Ingredients	F1	F2	F3
1	Lantana extract	10 ml	18ml	25 ml
2	Cetyl alcohol	1.5 g	1g	2g
3	White soft paraffine	6 g	4g	5g
4	Liquid paraffine	3 ml	2ml	3ml
5	Glycerin	12 ml	10ml	14ml
6	Propyl glycol	3.1 ml	2.7ml	2.9ml
7	Triethanolamine	0.9 ml	0.8ml	0.9ml
8	Methyl paraben	0.2 g	0.2g	0.2g

9	Propyl paraben	0.05 g	0.05g	0.05g
10	Stearic acid	13g	11g	12g
11	Neem oil	1-2 Drops	1-2 Drops	1-2ml
12	Aloe vera	5 g	7g	9g
13	Distilled water	15ml	15ml	15ml

2.6. PHYSICO-CHEMICAL EVALUATION TEST FOR LANTANA CREAM

Prepared lantana cream was inspected visually for its appearance, color, odor, consistency, homogeneity, oily feel.

2.6.1. Appearance

Verified the appearance of the formulated lantana cream visually.

2.6.2. Color

The color of the formulated lantana cream was checked visually.

2.6.3. Odor

The odor of the formulated lantana cream was checked by normally by smelling.

2.6.4. Consistency

The formulated lantana cream consistency was determined by visual appearance.

2.6.5. Homogeneity

The homogeneity of the formulated lantana cream was checked visually and touch.

2.6.6. Phase separation

The prepared cream was stored at room temperature, out of direct sunlight, in a covered container. Phase separation was then monitored for 24 hours during a 30-day period, and any changes were noted.

2.6.7. Skin irritation

The model was exposed to a test chemical or substance for forty-two minutes. After the chemical was removed, the model was incubated for an additional forty-two hours.

2.6.8. Washability

After applying a tiny bit of cream, the hand was cleaned with tap water. Verify whether it can be washed.

2.6.9. Greasiness

A smear of the cream is put to the skin's surface, and its oiliness or grease-like consistency was examined. Make sure it's not too greasy.

2.6.8. Determination of pH

A digital pH meter measured the prepared lantana cream formulation. Cleaned the pH meter electrode with distilled water. The pH meter was standardized with standard buffer solution using buffer tablet of known pH 4.0 to read the pH correctly, dissolving one pH tablet in 100mL of distilled water. The electrode was placed in a buffer solution and waited until the reading was constant. If needed, adjust the pH to 4.0. Checked the pH by dipping the electrode (approximately 4cm depth) into the formulated lantana camara cream and waiting until the value on the display was constant. Then the pH measurement was recorded.

2.6.9. Spread ability test

A formulation's spread ability measure how easily it spreads on the skin upon application. The formulated cream of about 100mg was positioned on the previously marked center at the front side of the glass plate (7×3cm), covered by a second glass slide, and applied weigh about 100gm over the glass slide for 5 min. measured the diameter (in cm) of each spread circle area of cream, and the value represents the spread ability value of the cream.

2.6.10. Determination of viscosity

Viscosity is a vital parameter for physicochemical evaluation for any flow measurement of fluid. Various instruments are used to determine the viscosity, such as the Ostwald viscometer, fall ball viscometer, cup, bob viscometer, Brookfield viscometer, cone and plate viscometer, etc. Amongst all the viscometers mentioned above, Brookfield is the favored one for determining cream viscosity. The viscosity of the prepared cream was determined with the help of Brookfield viscometer.

2.6.11. Determination of melting point or range

It is defined as the point at which or range of temperature the substance melts completely. Melting point of lantana cream was conducted by using melting point apparatus. A thin-walled hard glass capillary tube with a narrow inner diameter of 0.8 to 1.1 mm, about 100-120 mm in length, with a thickness of 0.2 to 0.3 mm, was taken for this experiment. A few mg of lantana cream was filled inside the capillary tube and placed over the metal block present inside the melting point instrument. As the melting point instrument was switched on, the temperature in metal was increased at a controlled rate, and a thermometer checked the increase in temperature. Noted the melting point or range of lantana cream as it completely melted.

2.6.12. DETERMINATION OF ANTIBACTERIAL ACTIVITY

The antimicrobial activity of the extracts was determined by the disk diffusion and shake flask test (Rios, Recio, & Villar, 1988). 20 ml of sterile nutrient broth in a 100 ml flask was inoculated by a single colony from a stock culture with a loop and incubated in a shaking incubator at 37C and 110 rpm for 24 hours. After overnight incubation, bacterial culture was diluted in a Nutrient broth of 20 ml for 3 hours at 37 C and 110 rpm. Then one ml of this was serially diluted 3fold to get a target concentration of optical density of 0.1 to 0.3, roughly equal to 1.3 × 10^8 CFU/ml.

Disk diffusion method

200µl of this culture was spread on nutrient agar plates. A well was prepared with a pasture pipette, 200µl of the extract was loaded into the well, and the control well was loaded with the respective solvent. Plates were incubated at 37C for 24 hours. The antibacterial activity was assessed by measuring the inhibition zone. Images were recorded.

3. RESULT AND DISCUSSION

3.1. Physical evaluation

Table No: 3.

Sl. No	Parameter	Observation
1	Appearance	Smooth, Uniform and consistent cream
2	Color	Greyish -white
3	Odor	Pleasant
4	Consistency	Semi solid, easy to spread
5	Homogeneity	Uniform with no visible lumps or phase separation
6	Phase separation	No phase separation observed over time

7	Skin irritation	No skin irritation experienced
8	Washability	Easly washable without any stickiness
9	Greasiness	None greasy and left no oily residue

3.2. pH

Table No: 4.

Formulation	pH
F1	5.80
F2	6.50
F3	6.95

Fig No. 3: Determination of pH.

3.3. Spreadability test

Table No: 5.

Formulation	Diameter	Spread ability
F1	5.1cm	Moderate
F2	5.8cm	Good
F3	5.6cm	Good

Fig No. 4: Determination of spread ability.

3.4. Viscosity

Table No: 6.

Formulation	Viscosity
F1	1010mPa
F2	1085mPa
F3	1066mPa

Fig No. 5: Determination of viscosity.

3.5. Melting point

Table No: 7.

Formulation	Melting point
F1	70°C
F2	75°C
F3	72°C

3.6. ANTIBACTERIALACTIVITY BY DISC DIFFUSION METHOD

Table No: 8.

SI. No	Sample	Concentration (µg/ml)	Zone of inhibition	
			Staphylococcus aureus	Escherichia coli
1	F1	50	19mm	13mm
2	F2	50	24mm	21mm
3	F3	50	21mm	12mm
4	Standard (Gentamicin)	50	28mm	30mm

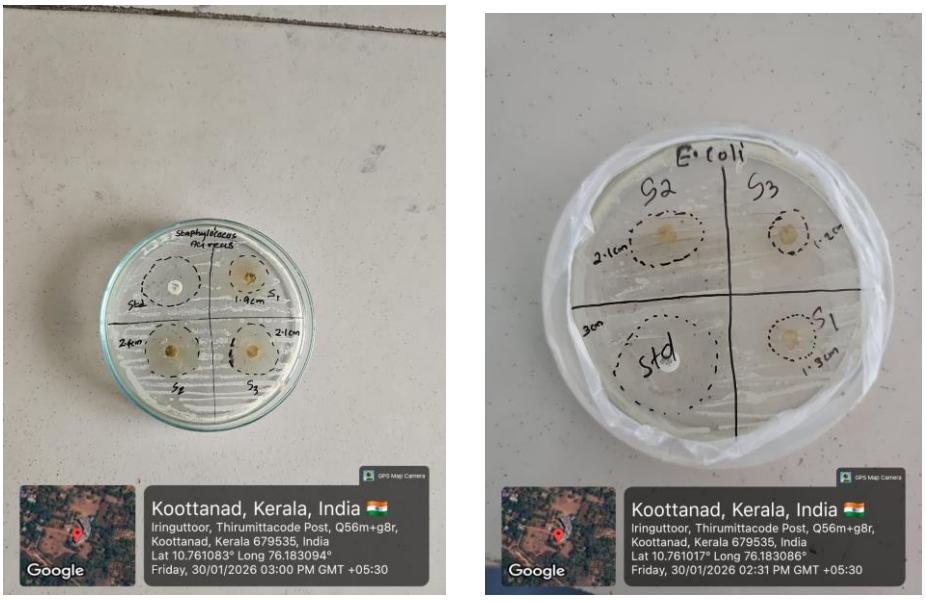


Fig No. 6: Zone of inhibition of *Staphylococcus aureus* and *Escherichia coli.*

DISCUSSIONS

Lantana camara plant was collected from Thirumittacode, Palakkad district, the plant including leaves and flowers are used for this study and the authentication procedure was carried out from Sree Neelakanta Govt. Sanskrit College, Pattambi, Palakkad, Kerala – 679306.

The plant leaves were thoroughly washed and then shade drying will carry out for nearly a month. Through the use of a grinder, the dried material is ground into a coarse powder. Then it extracted by using Soxhlet apparatus. The extract is collected and mixed in the ration in given formulation F1-F3 by using electrical stirrer. 3 formulations are prepared and evaluated.

Evaluations including physical evaluation, PH, spread ability, viscosity, anti-bacterial activity was analyzed.

The 3 formulations show a characteristic greyish -white color with a pleasant odour having fine smooth texture. The 3 formulations are then evaluated for Ph, spread ability, viscosity and anti-bacterial activity. F2 formulations shows comparatively standard values then all other formulations.

In the physico-chemical evaluation, the F2 formulation shows pH 6.50, spread ability was good (5.8 diameter), viscosity 1085mPa and melting point 75°C. Neither of the formulations shows no irritancy. And clearly shows easily washability character.

Anti-bacterial property of each formulation F1-F3 was evaluated by using 2 different species of bacteria including Escherichia coli, Staphylococcus aureus in comparison with a standard antibacterial agent as a standard including the Gentamicin. The F2 formulation shows 21mm in E. coli and 24mm in S. aureus as the Zone of Inhibition which shows a notable antibacterial activity when compared to the standard.

4. SUMMAYAND CONCLUSION

The preparation and evaluation of *Lantana camara* cream used against bacterial activity demonstrated promising outcome, particularly in terms of its formulation and physical properties. lantana, known for its anticancer properties, anti-inflammatory properties, antidiabetic properties, anthelmintic properties successfully incorporated into cream, which improved its stability and solubility. The evaluation of the cream showed favorable characteristics such as suitable viscosity, spread ability, and good ability for skin penetration, all of which are crucial for effective anti-bacterial activity.

Although in vivo studies were not conducted in this phase, the formulation should be effective for the bacterial activity inhibition. The study concludes that *Lantana camara* can be effectively utilized in the formulation of an antibacterial cream, offering a natural, economical, and safer alternative to synthetic antibacterial agents. Further studies including advanced clinical evaluations can help in exploring its potential for large-scale pharmaceutical and cosmetic applications.

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