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Formulation of Antibacterial Herbal Cream from *Mimusops Elengi* Flower Extract

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ABSTRACT:

Introduction: *Mimusops elengi* (Spanish cherry) is a well-known medicinal plant and used traditionally from ancient year in the different medicinal systems such as Ayurveda and Siddha etc. The flowers of *Mimusops elengi* have antibacterial and wound healing properties. Objective: The aim was to formulate the antibacterial herbal cream by using *Mimusops elengi* flower extract and evaluate the herbal cream. Material and method: *Mimusops elengi* flower powder was extracted using 70% methanol via maceration for 48h. The cream was formulated through Trituration method, using Beeswax as an emulsifier, Borax as a buffering agent, Liquid paraffin as an emollient, and Sodium benzoate as a preservative. Water was used as the solvent, Rose oil as a fragrance and Peppermint oil as a soothing agent. The Methnolic extract of flower was incorporated at various concentrations to evaluate its antibacterial effectiveness by Zone of Inhibition studies. Results: The *Mimusops elengi* flower extract containing phytoconstituents flavonoids, terpenoids and phenols were present. Among the three formulations tested, Formulation 3 emerged as the most effective in terms of antibacterial activity against the pathogen, with a zone of inhibition is 10.1 mm. The pH was 6.69 and viscosity of the formulation F3 was 3927cps. The Spreadability of F3 is 7.38 gcm/sec along with no phase separation in the formulation F3. The formulation F3 was found to be in stable by physical evaluation and stability studies. Conclusion: The results showed that the formulated cream can be used for bacterial infections. This formulation required further researcher and development of commercial standard.

Keywords: *Mimusops elengi*, Antibacterial activity, Sodium benzoate

1. Introduction

Infectious diseases are still considered as the second leading causes of death globally. Antibacterial activity refers to those substances that shows activity of slow down the growth of bacteria. Antibiotics have been revealed to tackle different types of infectious disease however; bacteria are continuously evolved to grow resistance for existing antibiotics. Because of this antibiotic-resistance bacteria are on the rise. For past few Years, antibacterial agents and potential substance which are derived from plant secondary metabolites have gradually grown attention to counter antibiotic-resistance. The alternative way was to face such problem is to use plant secondary metabolite as resistance-modifying agents.[1] Herbal plants are origin of traditional medicine, useful for primary health care system. The conveying of drugs through the skin is encouraging concept due to ease of access, large surface area, vast exposure to the circulatory blood vessels & lymphatic networks. The protective nature of the treatment, instead of the alternative formulation like herbal medicine may also be prepared in the form of cream. The cream is a viscous semisolid preparation, applied externally on body surface area such as the skin and face etc.[2]

Biological and pharmacological activities are different for different parts of the plant *Mimusops elengi*. The bark is acrid and sweet. It is being used as anthelmintic and astringent. The flower is sweet, acrid and is used as antibacterial, wound healing, Hyperlipidemic activities. The Leaves are known for various pharmacological activities like analgesic and antipyretic properties, antiviral, anticarcinogenic, and free radical scavenger.[5] Based on the reported therapeutic activity of *Mimusops elengi* flower is antibacterial and wound healing properties. This flower contains many important chemical constituents which are Tri-terpenoids are ursolic acid, beta-sitosterol and lupeol; Phenolic compound gallic acid and Flavonoid quercetin and kaempferol contents.[6] Powder of dried flower is a brain tonic and is useful as a snuff to treat cephalalgia. It is mainly as stimulant and also used as an expectorant, cure biliousness, liver complaints. Methanol extract of *Mimusops elengi* flower is tested of its antibacterial activities. Furthermore, extract is active material for preparation of cream.[7,8] From time immemorial creams as, topical preparation is considering an important part of cosmetic product as even creams, which are based on techniques developed by pharmaceutical industry and unmediated creams are highly used in a variety of skin condition. Cream can be applied on any part of the body surface with ease. It is convenient to use cream by all age group people. Cream is basically emulsion formulation of oil and water. In coming future demand of herbal constituents-based creams is increasing day by day.[9]

2. Objectives:

The primary objective is formulation of antibacterial herbal cream using *Mimusops elengi* Linn flower extract.

➢ To perform the herbal extract from flower of *Mimusops elengi* Linn.

➢ To perform Phytochemical tests.

➢ Formulation of herbal cream using flower extract.

➢ To preform Post evaluation studies.

3. Methodology

3.1 Collection of plant material:

The flower of *Mimusops elengi* were collected form western ghats of Karnataka and verified by taxonomist.

3.2 Extraction of *Mimusops elengi* Linn Flower:

Collected flowers are washed with sterile distilled water and air dried. Flowers were milled too coarsely powdered. 500 grams of milled *Mimusops elengi* flower powder is weighed into separate sterile beaker. The samples flower powder was extracted using 70% methanol and allow to standing for 48 hours at room temperature with occasional shaking. Later, it was filtered into sterile beaker using muslin cloth. The filtrate obtained was then poured into china dish and air dried. Dried powder extract was stored in a desiccator until futheruse.[8]

3.3 Phytochemical test for flower extract:

A] For Flavonoids, Alkaline Reagent Test: For this teat add few drops of NaOH solution to the *Mimusops elengi* flower extract results in the formation of intense yellow color which disappeared upon addition of concentrated HCL which indicates the presence of flavonoids.[12]

B] For Phenols, Ferric Chloride Test: To the *Mimusops elengi* flower extract add few drops of 1% $FeCl_3$ solution which results in the formation of deep red color which indicates the presence of phenols.[12]

C] Test for Terpenoids, Salkowski Test: To the *Mimusops elengi* flower extract add 2ml of chloroform and 2ml of concentrated H_2SO_4 to form a layer result in formation of reddish-brown coloration of the inter face b/w to liquid layer indicates the presence of terpenoids.[12]

3.4 Formulation of cream

The present research was formulation of antibacterial herbal cream by using trituration method. The cream formulation was w/o type of emulsion. In this first melt the oil phase that is beeswax and liquid paraffin in porcelain dish using double boiler at 75℃ and mix the Methanolic flower extract in this oil phase. In a separate container water phase was heated, that is borax, sodium benzoate and distilled water at 75℃. Then combine the water phase with the oil phase while stirring continuously. Transfer the mixture to a mortar and triturate using a pestle for about 10-15 minutes to create smooth emulsion. Once cooled, add essential oils like rose oil and menthol. Then transfer the cream to a sterilized container for storage. The trituration method is a simple and widely used technique for preparing creams, especially when solid ingredients need to be uniformly dispersed within a cream base. This method involved grinding or mixing substance to ensure even distribution and achieve a smooth texture.

Sl.No	Ingredients	F1	F2	F3
1.	*Mimusops elengi* flower extract	2.0g	2.5g	3.0g
2.	Bees wax	3.2g	3.2g	3.2g
3.	Liquid paraffin	10ml	10ml	10ml
4.	Borax	0.16g	0.16g	0.16g
5.	Sodium benzoate	0.02g	0.02g	0.02g
6.	Rose oil	0.5mL	0.5mL	0.5mL
7.	Pepper mint oil	0.5ml	0.5ml	0.5ml
8.	Purified water	q.s	q.s	q.s

Table no.1 Cream Formulation contents

3.5 Evaluation of cream

3.5.1 Organoleptic evaluation

Formulated herbal cream formulation was evaluated by using the following Organoleptic parameters for its physical nature.

a) Colour: The colour of the cream was observed by visual method.

b) Odour: The odour of cream was observed and results were recorded.

c) Consistency: Cream was applied on the skin manually and it was examined for its consistency.

d) State: The state of cream was examined by visual method.

3.5.2 Determination of pH

Solutions of prepared formulations were prepared by dissolving 1g of cream in 100ml of distilled water in volumetric flask and set aside for 2 hrs. Later, by using Digital pH meter the pH of prepared herbal cream formulations was measured.

3.5.3 Spreadability test:

Spreadability of formulated cream formulations was measured by placing sample formulation in between two slides. Later, it was compressed to uniform thickness by placing a definite weight for a definite time. The specified time required to separate the two slides was measured.

$$\text{Spredebility} = \frac{\text{Weight tide to upper slide(M)} \times \text{Length of glass slide(L)}}{\text{Time taken to separate slide(T)}}$$

Where S= Spread ability, M= Weight tide to the upper slide, L= Length of glass slide, T= Time taken to separate the slides.

3.5.4 Washability test:

Results of washability test is by applying herbal cream formulations on the skin and then the ease extends of washing with water were recorded.

3.5.5 Non-irritancy Test:

By applying herbal cream formulations on the skin and observation for 24 hrs for its irritant nature.

3.5.6 Viscosity:

Brooke field viscometer was used for determining the viscosity of cream at the temp of 25℃ using spindle no. 63 at 10rpm.

3.5.7 Phase separation:

For Phase separation test, the prepared formulations were transferred in a suitable sterile wide mouth container and set aside for 24 hrs. Later, separation of oil and water phase was determined by visually.

3.5.8 Determination of Zone of inhibition (Antibacterial activity):

Zone of inhibition was carried out by agar gel diffusion method here, the culture is grown in nutrient broth and incubated at 37℃ for 24hrs. Inoculate 0.1 ml of culture as seed in 25 ml molten nutrient agar media. It was mixed, poured into a sterile petri plate and allow to solidify. The well was bored with 6mm size in seeded agar. 0.1g of cream formulation and commercial formulation is added in petri plate as standard. Plates were kept at 10℃ as a pre diffusion period for 30min. Later, it was normalized at room temperature then the plates were incubated at 37℃ for 24hrs. After incubation period the zone of inhibition was measured.

3.5.9 Stability studies:

The stability studies for a drug component are performed according to the ICH guidelines. The herbal cream was filled in a tube and placed in the stability chamber maintained at room temperature and relative humidity. At the end of study, samples were investigated for the physical properties, pH and viscosity.

4. Results

4.1 Phytochemical test for flower extract

Sl.no	Secondary metabolite	Test	Observations	Result
1	Flavonoids	Alkaline reagent test	Yellow colour	Positive
2	Phenols	Ferric chloride test	Deep red colour	Positive
3	Terpenoids	Salkowski test	Reddish brown colour between two Liquid	Positive

Fig.1 *Mimusops elengi* flower extract

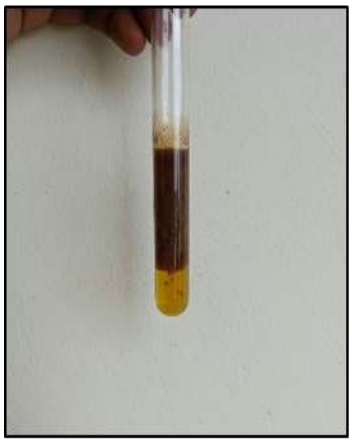

Fig no.2 Alkaline reagent test

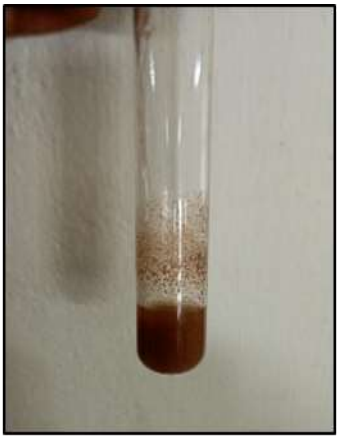

Fig no. 3 Ferric chloride test

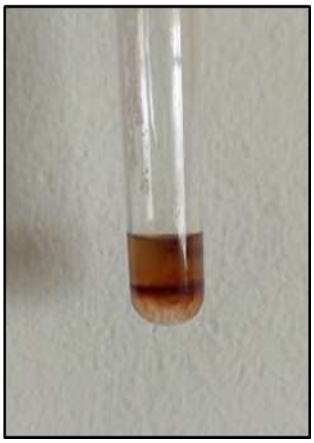

Fig no.4 Salkowski test

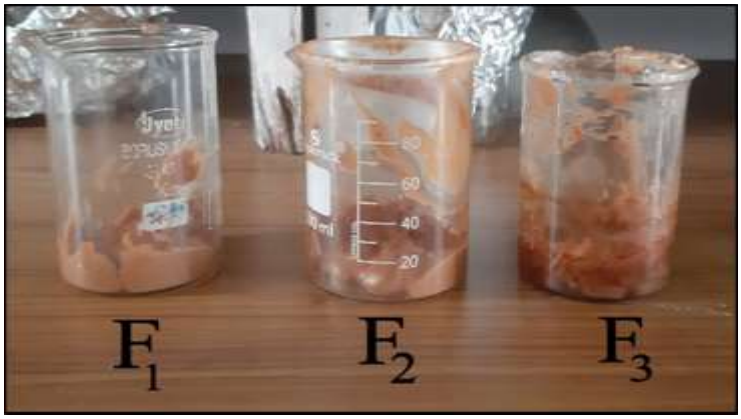

Fig no.5 Various formulations of herbal cream

4.2 Organoleptic and Physical evaluation of formulation

Sl.no	Tests	F1	F2	F3
1	Colour	Reddish-brown	Reddish-brown	Reddish-brown
2	Odour	Characteristic	Characteristic	Characteristic
3	Consistency	Smooth	Smooth	Smooth
4	State	Semi-solid	Semi-solid	Semi-solid
5	pH	6.92	6.79	6.69
6	Spreadability (gcm/sec)	7.42	7.41	7.38
7	Washability	Easily washable	Easily washable	Easily washable
8	Non-irritancy test	Non-irritant	Non-irritant	Non-irritant
9	Viscosity (cPs)	3879	3896	3927
10	Phase separation	No	No	No

Table no.3 Organoleptic and Physical evaluation results

4.3 Zone of inhibition

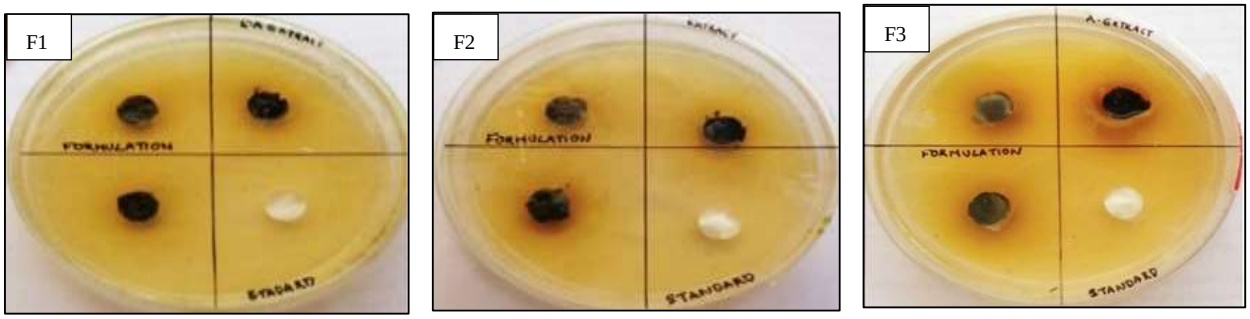

Fig no.6 Zone of inhibition of formulations

Sl.no	Formulation	Zone of Inhibition (mm)
1	Control	0
2	Standard	12
3	Extract	5
4	F1	8
5	F2	9
6	F3	10

Table no.4 Zone of Inhibition results

4.4 Stability studies:

Sl.no	Tests	F3 formulation	Stability studies
1	Colour	Reddish-brown	Reddish-brown
2	Odour	Characteristic	Characteristic
3	Consistency	Smooth	Smooth
4	State	Semi-solid	Semi-solid

5	pH	6.69	6.69
6	Spreadability (gcm/sec)	7.38	7.35
7	Washability	Easily washable	Easily washable
8	Non-irritancy test	Non-irritant	Non-irritant
9	Viscosity (cPs)	3927	3928
10	Phase separation	No	No

Table no.5 Stability studies results

5. Discussion:

The *Mimusops elengi* flower extract contain flavonoids phenols and terpenoids as phytochemical constituents. F1, F2 and F3 was Reddish-brown in color. All formulations had a characteristic odor, consistency are smooth and state of creams are semi-solid in nature. pH of F1is 6.92, F2 is 6.79 and F3 is 6.69. Spreadability of F1-7.42 gcm/sec, F2-7.41 gcm/sec and F3-7.38 gcm/sec. Viscosity of F1 is 3879cPs, F2 is 3896 and F3 is 3927 and all the formulations are easily washable and non-irritant in nature. The F3 formulation shows high antibacterial activities against E. coli in zone of inhibition as compared to F1 and F2. Finally, F3 formulation emerged as a most effective formulation when comparing all formulations in terms of properties and antibacterial activities against E. coli in determination of zone of inhibition.

6. Conclusion

The antibacterial herbal cream of *Mimusops elengi* flower extract was successfully developed with a promising result, stable formulation, desirable physical characteristics such as smooth texture, homogeneity, and appropriate pH for skin application. The Zone of Inhibition of the *Mimusops elengi* flower extract, showing effectiveness against bacteria. Among the three formulations, F 3 emerged as the most effective in terms of antibacterial activity, stability and overall performance. This suggested that the herbal cream has potential as a natural alternative for treating bacterial infections on the skin. Further studies, including long term stability tests, are recommended to confirm its efficacy and safety for widespread use.

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