



Research Article

Formulation Of Cream Containing Active Friction Of Cassia Fistula L Pulp And Its Antimicrobial Activity Against Acne Vulgaris

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ABSTRACT

Traditional medicinal plants are frequently utilized for the treatment of microbial diseases due to their abundant antibacterial properties and cost-effectiveness. Various extracts and their combinations were assessed using specific extraction techniques to target E. coli and Sauer's. The prepared formulations were then examined for their antimicrobial activity against two organisms responsible for acne, namely P. acnes.

Additionally, the cream containing different concentrations of Propionibacterium acnes and Staphylococcus epidermidis exhibited both antibacterial and antifungal properties. By incorporating the active components of Cassia fistula fruit into an O/W cream base system, a cream can be formulated. It can be inferred that modifying the cream formula with the active ingredient Cassia pulp extract led to an increase in the inhibitory area against P. acnes.


INTRODUCTION

Cassia, also known as the Golden Shower in English and Amata's in Hindi, is a leguminous plant that is native to India, the Amazon, and Sri Lanka. It has also spread to various countries such as Mexico, China, Mauritius, East Africa, and South Africa. Cassia fistula, the scientific name for this plant, exhibits antibacterial, antifungal, and antimicrobial properties. The pulp of Cassia fistula is used to prevent acne vulgaris, a common skin disease. The skin, which covers the entire human body, serves as a physical barrier against harmful

agents. When the skin is damaged, its ability to protect against microorganisms weakens, leading to bacterial infections. Pseudomonas aeruginosa and Propionibacterium acnes are bacteria commonly found on the human skin that can cause infections. Gram-negative bacteria present in hospital facilities can also cause nosocomial infections. Propionibacterium acnes, a Gram-positive bacterium, is part of the normal skin flora and can contribute to acne. Antibiotics are commonly used to treat bacterial infections, but the misuse of these drugs has led to an increase in

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antibiotic resistance among bacteria. *Propionibacterium acnes* has been found to be resistant to erythromycin and clindamycin. Due to these antibiotic issues, there is a need to search for new drugs with antibacterial properties from natural sources. *Trengguli* (*Cassia fistula* L.) is a plant that has traditionally been used to treat various diseases. It has been reported to have many biological activities, including antioxidant and hepatoprotective properties, as well as wound healing abilities, according to research conducted by Duraipandiyar and Ignacimuthu (2007).

The extract from *trengguli* has been found to have a minimum inhibitory concentration of 0.156 mg/ml for *Staphylococcus aureus* and 625 mg/ml for *Pseudomonas aeruginosa*. Previous research conducted by the team revealed that among the fractions of cassia seed, the ethyl acetate fraction exhibited the highest activity against *Staphylococcus aureus* and *Escherichia coli*. The minimum inhibitory concentration of the ethyl acetate fraction was 0.425% against *S. aureus* and 1.25% against *E. coli*. While studies on the antibacterial activity of the extract from *Cassia fistula* have been extensively reported, the application of the extract or active fraction of this plant has not been explored. In this study, the topical formulation of the active fraction of *Cassia fistula* was investigated for its potential as an antibacterial agent, considering its traditional use as a topical antibacterial agent. (1)

Acne is a skin disorder that affects the sebaceous follicles, which are specialized pilosebaceous units located on the face, chest, and back. These follicles consist of sebaceous glands and small hair follicles. The pathogenesis of acne involves various factors, including sebum production, abnormal follicular differentiation, the presence of *Propionibacterium acnes*, and *Staphylococcus epidermidis*. (2)

Cassia fistula has shown effectiveness against acne, a prevalent skin problem caused primarily by

the bacterium *P. acnes*. (3) Acne is a condition that affects the sebaceous follicles, which are specialized glands found on the face, chest, and back. These follicles are connected to small hair follicles and are influenced by several factors, such as sebum production, follicular imbalance, *Propionibacterium acnes*, and more. Sebum, the lipid-rich secretion of the sebaceous glands, plays a crucial role in the development of acne and provides an environment for the growth of *P. acnes*. Individuals with acne tend to have higher sebum levels compared to those with healthy skin, and the severity of acne is often associated with the amount of sebum produced. The enlargement of the sebaceous glands is also a characteristic feature of acne

Acne- what is acne?



Fig.no 1. Acne (*Acne Vulgaris*)

Causes of acne

- Hormone Imbalance
- Heredity
- Diet
- Genetic changes
- Stress
- Environment factor
- Medication

Type of acne:

- Comedones
- Blackheads
- Whiteheads
- Papules

- Pustules
- Nodules
- Cysts

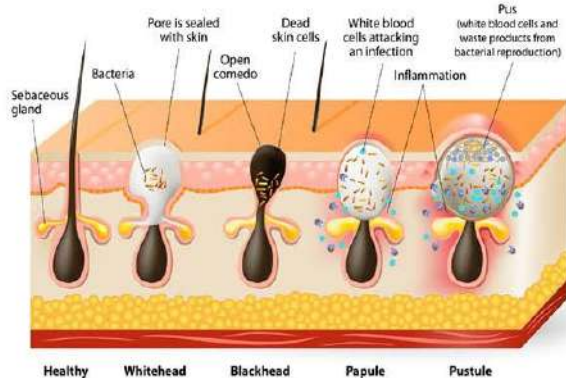


Fig. no 2 Acne Vulgaris Origins

Treatment for acne:

- Treatment consisting of skin care
- Medication
- Self care
- Topical treatment (gels cream and lotion)

Pathophysiology of acne:

There are several factors that need to be taken into account when determining a treatment plan for acne. These factors include the specific type of acne, the severity of the condition, the presence of scarring, previous treatment attempts, and the psychological impact it has on the individual. In the case of girls and women, additional information about their menstrual history, such as regularity, duration, and amount of bleeding, as well as signs of hormonal abnormalities like excessive facial hair and insulin resistance, can be useful. The most common bacteria linked to acne is *Propionibacterium acnes* (*P. acnes*), which is a normal part of the skin's flora and resides in sebaceous hair follicles. However, *P. acnes* plays a significant role in the development of acne vulgaris, as it contributes to the inflammation and irritation associated with the condition. (3)

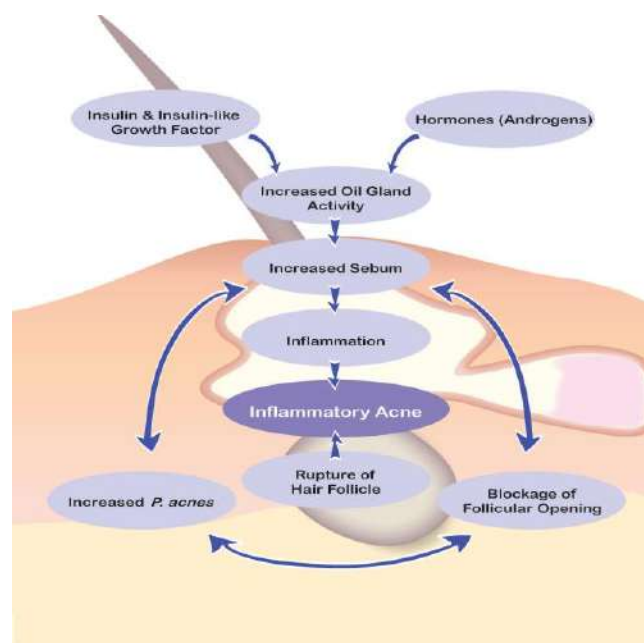


Fig.no 3 Pathophysiology of acne

Collection of plant material:

The garden is the source of cassia fistula fruit, which is then processed to extract its pulp. (4)

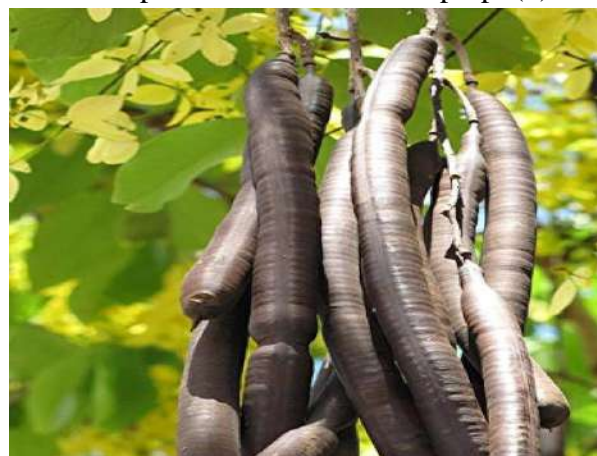


Fig.4.: Golden shower tree (Cassia Fistula)

Extraction process of cassia fistula:

Collect the fruit pulp and proceed to boil it with water. Afterward, filter the resulting mucilage using a muslin cloth and carefully squeeze the material to separate any residue from the filtrate. (5)

Formulation & evaluation of cream for skin care using extract of cassia fistula:

Crems are classified as a semi-solid emulsion that contains a combination of oil and water. They are designed to moisturize the skin on the face and

other parts of the body (6). The skin is the largest organ in the human body, consisting of two main layers: the epidermis, which acts as a protective barrier and prevents water loss, and the dermis, which contains glands, blood vessels, and receptors. (7) Natural skin care products provide essential nutrients that promote healthy skin, resulting in improved tone, texture, and appearance. Moreover, phytochemicals found in these products have been found to inhibit or halt the physiological processes that contribute to various common skin disorders, including skin aging, acne, and hyperpigmentation. These herbal extracts are often included in skincare formulas due to their medicinal properties, such as antioxidant capacity, pigmentation reduction, and antibacterial activity. Consequently, they can aid in the prevention and alleviation of a wide range of skin disorders (8). Acne is a prevalent skin disorder that can be attributed to various factors such as sebum secretion, hormone levels, bacterial infection, and inflammatory reactions. The development of acne is typically associated with blocked hair follicles, hyperkeratosis, keratin formation, and excessive sebum production. Propionibacterium acnes, a Gram-positive bacterium, is commonly found on the skin surface and can exploit sebaceous units for nourishment, leading to increased sebum production. (9) Inflammation triggered by acne results in the release of metabolic byproducts, proteases, and chemokines that attract neutrophils. (10) When comedones rupture, the contents of the sebaceous unit spread into the surrounding dermis, giving rise to stubborn acne vulgaris lesions resembling vegetations. These lesions can manifest as nodules, pustules, and papules. (11) Additionally, fungal infections of the skin can also contribute to the development of acne.

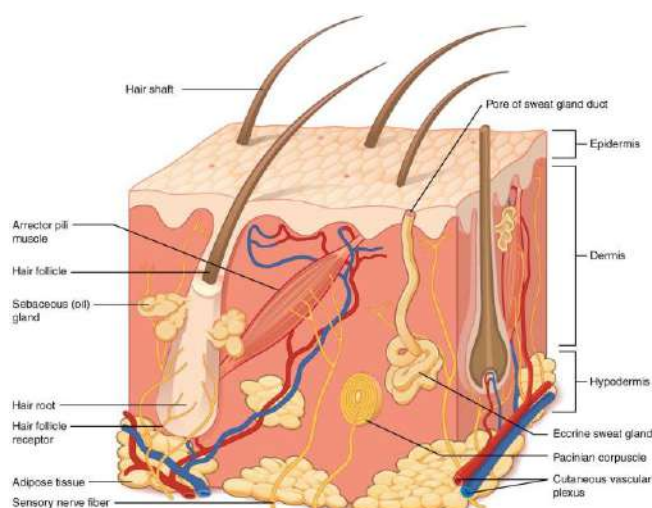


Fig. no 5 Structure of skin

Formulation Table

Sr No.	Name of Ingredients	F1	F2	F3
1	Cassia fistula pulp	2gm	3gm	3.5gm
2	Stearic acid	4gm	3gm	2.5gm
3	Lanolin	1.5gm	1.5gm	1.5gm
4	Glycerin	3ml	3ml	3ml
5	Triethanolamine	2ml	2ml	2ml
6	Methyl paraben	0.8gm	0.8gm	0.8gm
7	Propylparaben	0.5gm	0.5gm	0.5gm
8	Rose water	q.s.	q.s.	q.s.
9	Purified water	q.s.	q.s.	q.s.

Formulation of vanishing cream:

1. Preparation of Oil Phase:

Heat the liquid paraffin and beeswax in a borosilicate glass beaker to a temperature of 75 °C and ensure that the heating temperature is maintained. (Oil phase).

2. Preparation of Aqueous Phase

In a separate container, combine borax and methylparaben with distilled water and raise the temperature of the container to 75 °C. This will facilitate the dissolution of borax and methylparaben, resulting in a transparent solution. (Aqueous phase).

3. Addition of aqueous phase to oil phase:

Gradually incorporate the aqueous phase into the heated oily phase (12).

4. Addition of plant extract:

Next, incorporate a quantifiable quantity of cassia fistula pulp extract and mix vigorously until it transforms into a seamless cream. Subsequently, introduce a small number of rose oil droplets to enhance the aroma.

5. Storage:

Keep in tight sealed container and store in cool location.

Evaluation test:

- Physical properties
- pH
- Viscosity
- Spread ability test
- Irritancy test
- Test for microbial growth
- Determination of homogeneity
- Dilution test
- Saponification value
- Acid value
- Dye test

1. Physical evaluation:

cream is observed for color, odor and appearance

Sr. No	Test	Observation	Inference
1	Colour	Brown Beige	Brown Beige
2	Odour	Characteristics	Characteristic
3	Texture	Smooth	Smooth
4	State	Semisolid	Semisolid

2. pH:

The calibration of the pH meter was accomplished by utilizing a standard buffer solution. Dissolving 0.5 grams of cream in 50.0 milliliters of distilled water, the resulting solution was subjected to pH measurement using a digital pH meter. The pH of the cream was determined to fall within the favorable range of 5.6 to 6.8, indicating its suitability for maintaining the pH balance of the skin.

3. Viscosity

The viscosity of the cream was measured using a Brookfield viscometer at a temperature of 25°C and a rotational speed of 20 rpm. The determined viscosity value was 27025cps, indicating that the

cream has a smooth and easily spreadable consistency.

4. Spreadability test:

The extent to which a topical application spreads on the affected area of the skin can be used to measure its spreadability. The efficiency of the formulation in providing therapeutic benefits also relies on its ability to spread. Therefore, it was necessary to determine the spreadability of the formulation. To do this, a 3g sample was applied between two glass slides and pressed together to create a uniform film of a specific thickness. A weight of 100g was placed on top for 5 minutes, and then an additional weight of 10g was added to the pan. The top plate was pulled using a string attached to a hook. The time it took for the upper glass slide to cover a distance of 10 cm over the lower plate was recorded. The spreadability can be calculated using the formula. (13)

$$S = M \times L / T$$

Where,

M - represents the weight attached to the upper slide

L- represents the length moved on the glass slide

T- represents the time taken.

It was observed that the cream used in the study was easily spreadable and effectively moisturized the skin surface of the human volunteers.

5. Irritancy test:

The formulation of creams may lead to irritation or allergic reactions due to the bases used. To assess the irritancy of the preparation, a patch test is conducted. An area of a specific size (Isq.cm) is marked on the left-hand dorsal surface. The cream is then applied to this designated area, and the time of application is recorded. The presence of irritancy, erythema, and edema is monitored at regular intervals for up to 24 hours and documented accordingly (14)

6. Test for microbial growth:

Prepare agar medium and utilize the streak plate technique to introduce the prepared cream onto the



agar medium of the plate. Additionally, create a control sample by excluding the cream. Subsequently, position the plate in an incubator and allow it to incubate at a temperature of 37°C for a duration of 24 hours. Following the completion of the 24-hour period, there was no observable indication of microbial growth. The incubation duration at 37°C was similar to that of the control samples. (15)

7. Determination of Homogeneity:

The homogeneity of the formulations was assessed through visual examination and tactile evaluation. It was determined that the cream exhibited uniformity, smoothness, and a consistent texture. (16)

8. Dilution test:

The determination of the emulsion type for the prepared vanishing cream was conducted through both the dilution test and the dye solubility test. The emulsion displayed stability during the dilution test when mixed with water, which indicated that it was of the O/W type, as water served as the dispersion medium. (17)

9. Saponification value:

To perform the experiment, begin by taking 2 grams of the substance and refluxing it with 25 ml of 0.5N alcoholic KOH for a duration of 30 minutes. Next, introduce 0.1 ml of phenolphthalein as an indicator and proceed to titrate it with 0.5N HCL. (18)

To calculate the saponification value, utilize the formula;

$$\text{Saponification value} = 28.05(b-a)/w$$

where:

A- represents the volume of titrate for the sample

B- represents the volume of titrate for the blank

W- represents the weight of the substance in grams.

10. Acid value:

Measure out 10 grams of the cream and dissolve it in a precisely weighed 50 ml mixture of alcohol and solvent ether in equal volumes. Next, attach

the flask to the condenser and reflux it with gentle heating until the sample dissolves completely. After that, add 1 ml of phenolphthalein and titrate it with 0.1 N NaOH until a faint pink color appears after shaking for 20 seconds. (19)

$$\text{Acid value} = 5.61n/w$$

Where:

w- the weight of the substances

n- the number of ml of NaOH required.

11. Dye test:

Mix the cream with scarlet red dye. Apply a small amount of the mixture onto a microscopic slide and cover it with a cover slip. Observe the sample under a microscope. If the dispersed globules appear red, then the ground is colorless. Note that the cream is of the o/w type. Conversely, in w/o type cream, the dispersed globules will appear colorless. (20)

RESULT

Sr. No.	Test	Results
1	Physical Appearance	
	1. Colour	Brown Being
	2. Odour	Characteristic
	3. Texture	Smooth
	4. State	Semisolid
2	PH	6.1
3	Viscosity	27025 cps
4	Spreadability test	Easily spreadable
5	Irritancy test	Non irritative
6	Test for microbial growth	No microbial growth observes
7	Determination of homogeneity	Homogeneous and smooth consistent
8	Dilution test	O/W type emulsion
9	Saponification value	22.3
10	Acid value	5.7
11	Dye test	O/W type emulsion

CONCLUSION

Recent research has demonstrated the antimicrobial efficacy of cassia fistula pulp. In light of this, an O/W type emulsion vanishing cream was developed using various ingredients and subsequently assessed. The cream, when applied to the skin, can effectively prevent acne vulgaris and enhance skin texture. Moreover, it is



easily spreadable and not discernible to the naked eye. The presence of cassia fistula in the cream has been found to significantly improve its antibacterial properties. The prepared cream has antibacterial activity due to this is retard the pimple formation on face

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