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UTILISING 'SEMAL KANTE' TO DEVELOP A NOVEL FORMULATION AND STANDARDISATION

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Abstract:

This research work mainly deals with the pharmacognostical evaluation, phytochemical investigation, and the development of a formulation by using Bombax ceiba L. thorns known as Semal Kante, a Sanskrit term that refers to the plant's thorny texture, it is a significant medicinal tree utilized in conventional medical systems. Pharmacognostical studies such as morphological, microscopic, powder analysis, and physicochemical evaluation were performed in detail to authenticate and standardize the crude drug. The preliminary phytochemical screening of the hydroalcoholic thorn extract showed the presence of various bioactive constituents like alkaloids, flavonoids, tannins, phenolics, and glycosides. Thin layer chromatography was done to confirm the presence of alkaloids and flavonoids depending on the suitable solvent system used.The total alkaloid content was calculated by a spectrophotometric method. In due consideration of the phytochemical potential, a herbal face serum was prepared using Bombax ceiba L. thorn extract and the formulation was assessed for its physical appearance, pH, spreadability, washability, stability, and skin irritancy. The product showed desirable physicochemical characters, good stability, and skin compatibility.

Key Words: *Bombax ceiba L.; Semal Kante (thorns of Bombax ceiba L); Pharmacognostical studies; Phytochemical studies; Herbal face serum.*

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PLANT INTRODUCTION:

***Bombax ceiba* Linn**

Bombax ceiba L., also known as the silk cotton tree, is a fast-growing member of the Malvaceae family found in regions including northern Australia and South Asia. This tree features large red flowers and woody thorns, with leaves comprising three to seven leaflets. It has significant medicinal applications, with all parts utilized in traditional systems like Ayurveda for their therapeutic properties, including antioxidant, anti-inflammatory, and antimicrobial effects.[1] The tree is culturally important, referred to as the "King of Forest," and is one of the five sacred trees in "Panchvati." Its phytochemical composition includes xanthones, flavonoids, and other compounds contributing to its various health benefits.[2]

Fig 1: *Bombax ceiba* L. Tree

Semal Kante

The words "Semal" and "Kante" are primarily from Hindi and Sanskrit, referring to the Silk Cotton Tree (*Bombax ceiba* L.), with "Semal" being the common name and "Kante" (meaning thorns/spikes) often describing its thorny trunk or bark, which is used in Ayurvedic medicine and local terms across India for this iconic tree. The term "semal" refers The name for the Silk Cotton Tree comes from the Sanskrit word Śālmalī. Kante. In Hindi/Marathi, this meaning "thorns" or "spikes," sometimes used as part of the name Kante Sanvar to describe the spiky trunk of the Semal tree, especially in Marathi. So it's a blend of Hindi and Sanskrit terminology used in India to describe this unique tree and its characteristics. [3]

MATERIALSAND METHOD:

1. PHARMACOGNOSTICAL STUDIES

Collection of plant material

The thorns were collected from Marthandam in Kanyakumari district of Tamil Nadu during the month of September.

a. Morphological characters

The morphological characters like colour, odour, taste, size, shape, extra features of the thorn were studied, and the results were tabulated.

b. Microscopical studies

The fresh thorn, bark and leaf was subjected to various anatomical studies. The sections of specimens were taken using sharp blade and stained with various staining reagents like Phloroglucinol-HCL, iodine, safranin and observed under microscope.

c. Powder microscopy

Majority of the crude drugs for commercial purpose are available in powder form. So, the powder microscopic studies give the anatomical characters of fragmented crude drugs. Glycerine mounted temporary preparations were made for powdered thorn.[4]

2. EXTRACTION OF PHYTOCHEMICALS FROM THORNS OF *BOMBAX CEIBA* .L

Fig.2 : Soxhlet apparatus

Soxhlet apparatus is commonly used for hot continuous extraction of plant constituents.

The process involves collecting fresh thorns from *Bombax ceiba* L. bark, washing them, drying, and crushing them to form a coarse powder. The Soxhlet apparatus is set up, and the dried powder is subjected to continuous hot Soxhlet extraction with 50 mL distilled water and 50 mL alcohol (ethanol 90%) in equal ratio at a temperature of 55-65°C during 32 cycles or until no further extractable content remained. The crude extract is isolated and used for phytochemical screening, TLC, and HPTLC analysis.

3. PHYTOCHEMICAL STUDIES

a. PRELIMINARY PHYTOCHEMICAL SCREENING

Preliminary phytochemical screening was done to identify different constituents present in extracts i.e. carbohydrates, proteins, lipids, flavanoid, tannins, glycosides, alkaloids, etc.[5]

b. THIN LAYER CHROMATOGRAPHY

TLC employs glass plates with a thin layer of silica gel applied. The plates were coated with a mixture of silica gel powder (30 g) and distilled water (60 mL). After coating, the plates were allowed to dry , followed by activating them at 110 °C for 30 minutes in an oven. The *Bombax ceiba* L. thorn extract was prepared in ethanol and 1–10 uL of the sample were applied on the TLC plates. The samples were developed using a TLC chamber containing a mobile phase that allows solvent to travel up to three-fourths (3/4) the height of the plates. After development, the resulting spots indicate separation of the sample into its components and will allow the calculation of Rf values.[4,6]

c. TOTAL ALKALOID CONTENT

A mixture containing 69.8 mg Bromocresol Green (BCG) dissolved into 3 ml of 2 N NaOH solution and 5 ml distilled water, was diluted to the final volume of 1000 ml with distilled water to produce a solution of BCG for colorimetric analysis. Phosphate Buffer prepared for the determination of quinine sulphate using 2.0 M Sodium Phosphate and 0.20 M Citric Acid at pH 4.7. Quinine sulphate solution was prepared by dissolving 1 mg of quinine sulphate distilled water. The sample was prepared by dissolving 10 mg of extract residue in 2 N HCL, filtering it, measuring 1 ml of the filtrate and washing 3 times using chloroform in a separatory funnel. Following triplicate washes, the mixture was neutralized with 0.10 N NaOH solution. After neutralizing, the mixture was added to 5 ml of BCG solution and 5 ml of the phosphate buffer. The resulting complex was extracted with chloroform and collected in a 10 ml volumetric flask and diluted with chloroform to volume. The same protocol was used to prepare standard solutions with aliquots of 0.4, 0.6, 0.8, 1.0 and 1.2 ml of the quinine sulphate standard solution and 0.10 N NaOH. After the samples were prepared, the absorbance of the chloroform layer was measured at 620 nm versus a reagent blank on a UV-Visible spectrophotometer. The λmax was determined from scanning the standard solution in the range of 200-800 nm and was determined to be 620 nm.[7]

FORMULATION OF HERBAL FACE SERUM

INTRODUCTION

Serums are gel or lotion-based skin care products designed for deep penetration, delivering active ingredients to improve skin texture, reduce pore appearance, and enhance moisture levels. They are non-greasy, absorb quickly, and contain a high concentration of active compounds.

SL. NO	INGREDIENTS	WEIGHING FORMULA
1	Bombax ceiba thorn extract	20% (4ml)
2	Glycerin	33% (6.6ml)
3	Methyl paraben	1% (0.2g)
4	Distilled water	26.5 % (5.3ml)
5	Tween 80	4% (0.8ml)
6	Coconut oil	9% (1.8ml)
7	Orange oil	6.5% (1.3ml)

Table 1. Ingredients

EXCIPIENT TABLE

SL. NO	INGREDIENTS	USE
1	Thorn extract	Antioxidant
2	Glycerin	Humectant
3	Methyl paraben	Preservative
4	Distilled water	Solvent
5	Tween 80	Emulsifying agent
6	Coconut oil	Moisturizing agent
7	Orange oil	Fragrance

Table 2. Excipients

METHOD OF PREPARATION

Fresh *B. Ceiba* L. prickles were processed into a fine powder and extracted with a Soxhlet apparatus.The oily phase, consisting of Tween 80, coconut oil, and orange oil, was mixed for 10 minutes, while the aqueous phase was created using the extract, glycerin, methyl paraben, and distilled water. The oily phase was then added to the aqueous phase to form a biphasic emulsion, with mechanical vibration. After filtration to remove impurities, the serum was collected, stored in clean, sterile containers and is kept away from sunlight and heat. [8,9,10]

5. STANDARDISATION AND EVALUATION OF HERBAL FACE SERUM

Physical evaluation:

Colour ,appearance , order, consistency were evaluated [11]

Homogeneity:

Spreading some of the serum mixture on the clear glass and watching it will confirm this. The serum should be distributed uniformly in the formulation.[12]

Spreadability:

The capacity of a face serum to spread across the skin is known as spreadability of liquid formulation, serum was spread across skin and how easily it spread is evaluated. It is crucial for administering a standard dose of a medication formulation on the skin.[13]

Washability:

The formulation should be easily washable when a tiny amount was applied to the hand and subsequently cleaned with tap water.

Phase separation:

The prepared product was stored at room temperature and out of direct sunlight in a closed container. After 24hours, phase separation was examined.

Irritancy:

After applying the serum on a selected area, the area was monitored for irritation, erythema, and oedema for up to 24 hours, and the results were recorded.[14]

Stability studies:

It uses accelerated stability analysis, which exposes the material to different temperatures, to determine the product's chemical and physical stability. For the formulation, a one-month short-term accelerated stability study was conducted. The sample was kept in various temperature storage settings.

PH of Serum:

The pH paper is used to evaluate it. The pH of serum should be between 4.1 and 6.7 because the skin has an acidic pH range.[15]

RESULT AND DISCUSSION:

1. PHARMACOGNOSTICAL STUDIES

Morphological Evaluation of *Bombax ceiba*

Feature	Description
Shape	Conical
Size	1-3cm
Average Dimensions	18-26mm
Texture	Rough
Colour	Pale ash to grey-brown
Aroma	Nil
Taste	Nil
Base	Broad and swollen
Apex	Sharp and pointed tip

Table 3. Morphological evaluation of *Bombax ceiba* L.

MICROSCOPY AND POWDER CHARACTERISTICS OF *BOMBAX CEIBA* L.

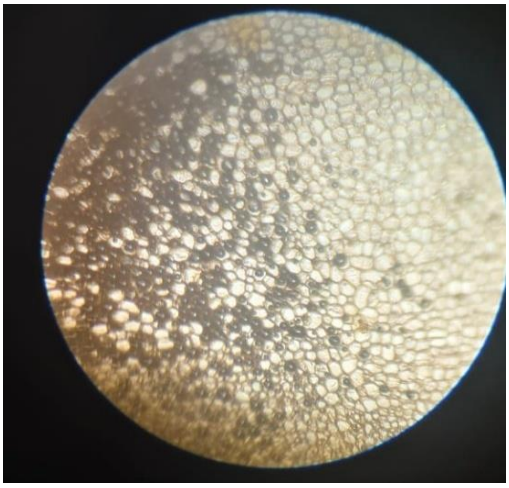

Fig. 3: Transverse section of thorn of *Bombax ceiba L.*

MICROSCOPY OF THORN OF *BOMBAX CEIBA* L.

Under microscope, thick-walled parenchymatous cells were found, mostly in the xylem region, along with a large number of tiny starch grains of different sizes. There were noticeable thick-walled, polygonal stone cells that contributed to mechanical strength. Brick-shaped to polygonal cork cells impregnated with suberin made up the cork cambium. The cortex was made up of hard, thick-walled, heavily lignified polyhedral to isodiametric cells, whereas phloem tissue was primarily parenchymatous. The thorn tissue's distinctive dark reddish-brown color was caused by the high tannin content.

POWDER CHARACTERISTICS OF *BOMBAX CEIBA* THORNS

Powder microscopy of *Bombax ceiba L.* thorns reveals diagnostic features such as cork cells, fibers, calcium oxalate crystals, and vessel fragments.Uni and multiseriate, heterogenous rays composed of procumbent cells, sheath cells are observed.Abundant tiny starch grains of various sizes and nonseparated fibres are present.Fibres are arranged alternately with narrowly banded or diffuse into aggregates located in parenchyma strands.

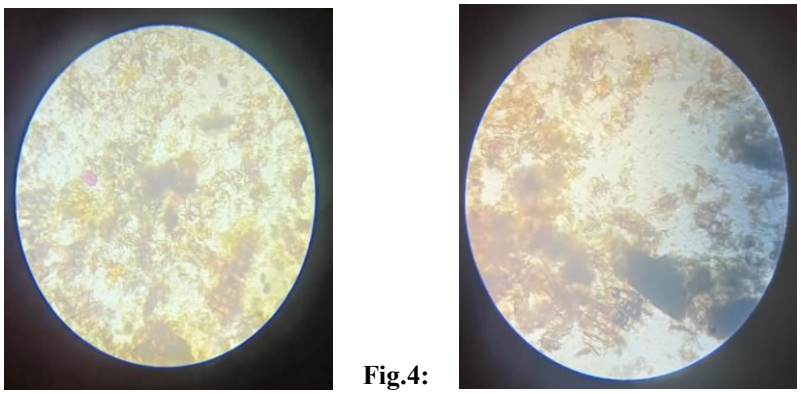

Fig.4:

Powder microscopy of thorn of *Bombax ceiba*

2. EXTRACTION OF PHYTOCHEMICALS FROM *BOMBAX CEIBA. L* THORN EXTRACT

The hydroalcoholic extract of *Bombax ceiba* . L thorns obtained by Soxhlet extraction yielded 14.3% w/w of dried extract.

3. PHYTOCHEMICAL STUDIES

a) Phytochemical screening Table

SL NO.	Phytochemical Group	Result
1.	Carbohytrates	+ve
2.	Proteins and Aminoacids	-ve
3.	Alkaloids	+ve
4.	Glycosides	-ve
5.	Flavonoids	+ve
6.	Tannins	+ve
7.	Steroids	-ve
8.	Saponins	-ve

Table 4. Phytochemical screening

b) Thin layer chromatography

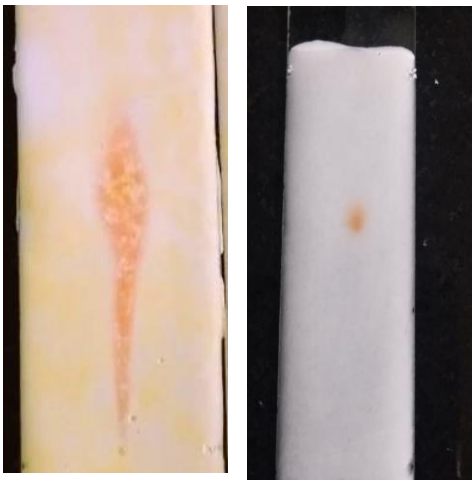

Fig.5: Toluene: Acetone: Ethanol: Ammonia 25% (first plate : Quinine sulphate (reference), second plate : sample)

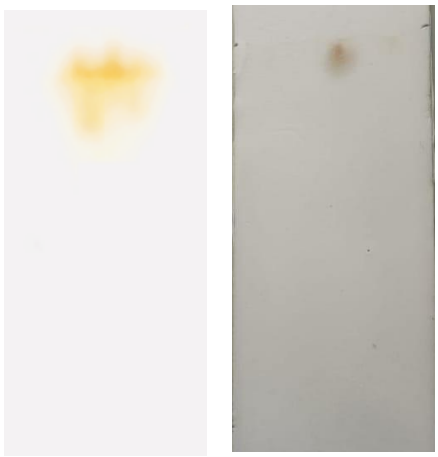

Fig.6: n-butanol : Acetic acid : Water (first plate : Quercetin (reference), second plate :sample)

Compounds	Mobile Phase	Ratio	Rf value
Alkaloids **a)** Reference (Quinine sulphate) **b)** Sample (*Bombax ceiba* L. thorn extract)	Toluene : Acetone : Ethanol : Ammonia 25%	45:45:7:3	**a)** 0.73 **b)** 0.68
Flavonoids **a)** Reference (Quercetin) **b)** Sample (*Bombax ceiba* .L thorn extract)	n-butanol: Acetic acid: Water	3:6:9	**a)** 0.88 **b)** 0.97

Table 5. Rf value

c) Total alkaloid content

A reference solution of standard alkaloid (1mg / 10ml) was made, and a portion of each of 0.4, 0.6, 0.8, 1.0 and 1.2 ml, corresponding to 40, 60, 80, 100, and 120 µg, respectively, was used in producing the calibration curve.

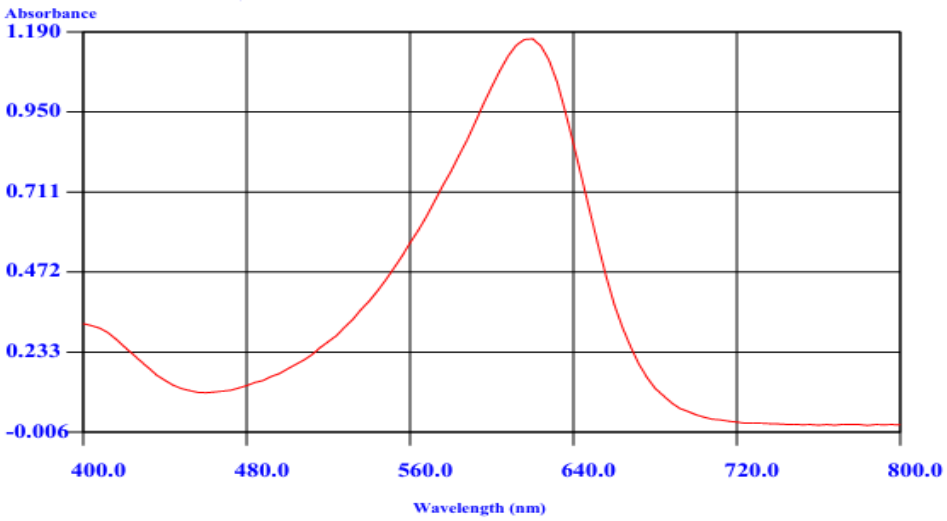

Fig.7: Calibration curve

Concentration (µg)	Absorbance (nm)
40	0.152
60	1.139
80	1.170
100	0.998
120	0.971

Table 6. Concentration and Absorbance

The absorbance measurement at 8 µg showed the greatest and most stable value at 1.170, therefore within the regions of the optimal linear calibration curve, hence it has been selected as the concentration for quantitative analysis.

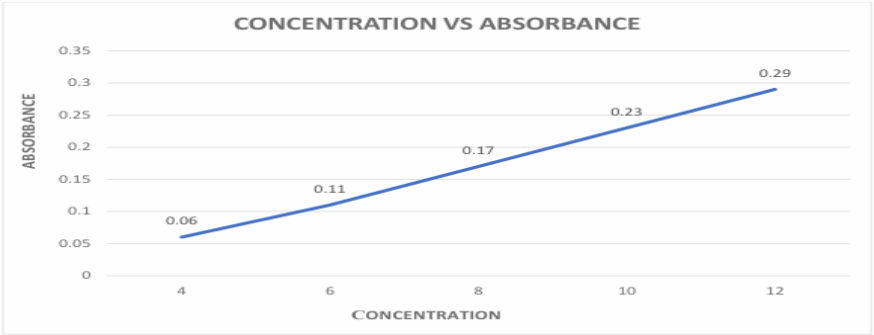

Fig.8:Concentration Vs Absorbance

The absorbance for the test solution was 0.2358 measured at 620 nm.

The total alkaloid content was found to be 0.161 mg/g

FORMULATION OF HERBAL FACE SERUM

Fig. 9 : Oil phase

Fig .10: Water phase

Fig .11: Mixing of water phase and oil phase

Fig .12: Face serum

5. STANDARDISATION AND EVALUATION OF FACE SERUM

TEST	OBSERVATION
Physical Evaluation • Colour • Odour • Consistency	 • Pale orange • Characteristic odour • Semi liquid
Homogeneity	Good
Spreadability	Easily spreadable
Washability	Easily washable
Phase Separation	No phase separation
Irritancy	No Irritation
Stability Test	No physical or chemical change
PH Value	5

Table 7.Standardisation and evaluation of face serum

CONCLUSION:

The current study paved the way for pharmacognostical standards and the phytochemical

profile of *Bombax ceiba* L. thorns, thus being a source of accurate identification, authentication, and quality control. The occurrence of alkaloids, flavonoids, tannins, and phenolic compounds as the major phytoconstituents of a therapeutic nature in the plant supports its use in traditional medicine. In addition, the measurement of total alkaloid content serves as a further confirmation of the pharmacological importance of *Bombax ceiba L.* thorns.

The herbal face serum prepared with the help of the *Bombax ceiba* L. thorn extract showed good physicochemical properties, proper pH, stability, easy application, and lack of skin irritation, which is an indication of its suitability for topical cosmetic use. Moreover, stability studies over an extended period, microbial limit tests, and dermatological safety evaluations will be necessary for the development of the formulation on a large scale. Besides, the use of *Bombax ceiba* thorn extract in other dermatological and cosmeceutical dosage forms can raise both its commercial and clinical potential to a higher level. *Bombax ceiba* L. thorns could be a valuable, eco, friendly source of nature for the next generation of herbal drugs and cosmetic products.

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