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Pharmacognostic Standardization and Phytochemical Screening of *ShalmaliKantaka (Bomax Ceiba. Linn)*

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ABSTRACT:

Medicinal plants continue to serve as the primary source of life-saving drugs for a major proportion of the global population, owing to their therapeutic efficacy, safety, and wide availability. Ayurveda, the ancient system of Indian medicine, has extensively documented numerous medicinal plants with multifaceted pharmacological actions. *Shalmali* (*Bombax ceiba* Linn.) is one such highly valuable medicinal plant, widely used in various classical formulations and therapeutic practices. Almost all parts of the plant—such as the bark, roots, flowers, thorns, gum, and seeds—are attributed with significant medicinal properties.

According to Ayurvedic literature, Shalmali possesses *Sheetala* (coolant), *Grahi* (absorbent), *Vrushya* (aphrodisiac), and *Dahanut* (relieves burning sensation) properties, making it especially useful in conditions associated with *Pitta* aggravation, excessive heat, bleeding disorders, diarrhea, and genitourinary ailments. Acharya Charaka has described Shalmali under important therapeutic groupings such as *Pureeshavirajniya*, *Shonitasthapana*, and *Vedanasthapana Mahakashaya*, indicating its role in regulating bowel functions, arresting bleeding, and alleviating pain. Furthermore, Acharya Sushruta has included Shalmali in *Priyangvadi Gana*, emphasizing its wound-healing, anti-inflammatory, and hemostatic properties. Modern pharmacological studies have also supported its traditional uses by demonstrating antimicrobial, anti-inflammatory, antioxidant, and aphrodisiac activities. Thus, Shalmali stands as an important medicinal plant with immense therapeutic potential, bridging classical Ayurvedic wisdom and contemporary scientific validation.

KEYWORDS:

BOMAX CEIBA. LINN, Thorns, stem bark, Standardization, pharmacognostic, phytochemical.

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INTRODUCTION:

Plants have formed the basis of sophisticated traditional medicine system that has been in existence thousands of years in countries such as China and India. The compounds which synthesized from the secondary metabolisms are socalled secondary metabolites. Secondary metabolites are formed in only specific organisms, or groups of organisms, are expression of the individuality of species. Secondary metabolites are not necessarily produced under all conditions, and in the vast majority of cases the function of these Compounds and their benefit to the organism are not yet knownIn Indian tradition, aerial parts of *BOMAX CEIBA* (Bombacaceae) have been used in the treatment of various skin troubles, especially paste of thorns work out on Acne vulgaris. *Shalmali*(BOMAXCEIBA) belong to the family Bombacaceae. It is known by different names such as red cotton tree, Indian kapok tree (English), *Shalmali*(Sanskrit), semal (Hindi), shimul (Bengali), mullilavu (Malayalam), and kondabruga (Telugu) in different languages. It is a deciduous tree attaining a height up to 40 meters and a girth up to 6 meter or more. In India, it is distributed throughout the hotter parts of the country up to 1500 meter or more. Its young stem and branches are covered with stout and hard prickles, its leaves are large, spreading, globous, and digitate, leaf lets are 5-7, lanceolate, and 10-20 cm long, and its flowers are numerous, large, fleshy, bright crimson, yellow, or orange containing many seeds with long, dense, silky hairs.[1][2][3][4][5][6]

The objective of the present study is to evaluate pharmacognostic standardization and phytochemical screening of bark and thorns of *Shalmali* for various activities. Phytochemical screening revealed the presence of flavonoids, steroids, tannins in the plant extract.

Materials And Methods-

A. Collection and authentication of plant material -The thorn and bark of *shalmali*were collected from hilly area of satara districtin month of march 2025 and were authenticated and identified by Department of Botany Y.C.Institute of Science, Satara. Ms.R.D.Namdas, Head of Department of Botany (TDG001 /KK001-17.07.2025). The Thorns and stems were shade dried and grinded in powder form for further study.

- **Morphological parameters Morphological study of the plant-** Morphological parameters Morphological study of the plant bark was carried out as per the reported methods.
- **Microscopical characters**-microscopic characteristic were studied in powdered form. The 3 g of plant material was taken into 25 ml glass stopped measuring cylinder. 25 ml of water was added and the mixture was shaken thoroughly, every 10 minutes for 1 h. It was allowed to stand for 3 h at room temperature. The mean value of the individual determinations was calculated related to 1 g of plant material.

B. Physico-chemical parameters[7]

- **Total ash-**The ground drug (1 g) was incinerated in a silica crucible at a temperature not exceeding 450°C until free from carbon and weighed to get the total ash content.
- **Acid insoluble ash-**The ash was boiled with 25 ml dilute hydrochloric acid for five minutes, filtered with ash lessfilter paper, washed with hot water and heated at a temperature not exceeding 450° C untilconstant weight attained.
- **Water-soluble ash-**The water insoluble part of ash was collected on an ash less filter paper and heated at 450°Cto constant weight. The resultant weight

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was subtracted from total ash to obtain water soluble ash.

- **Extractive values-**The extractable content of powder in mg per g was calculated using previously describedmethods for hot and cold extraction.
- **Loss on drying**the powdered drug sample (10 g) without preliminary drying was placed on a tarredevaporating dish and dried at 105°C for 6 h and weighed. The drying was continued until twosuccessive reading matches each other or the difference between two successive weighingwas not more than 0.25%. Constant weight was reached when two consecutive weighing afterdrying for 30 min. in a desiccator, showed not more than 0.01 g difference.
- **Determination of pH-**The pH of 1% and 10% solution of powder in water was determined.
- **Foaming index**Approximately 1 g of plant material was reduced to a coarse powder, weighed accurately andboiled moderately in water for 30 min. The cool decoction was poured into test tube, shakenlongitudinally for 15 s. After 15 min the height of foam was measured.Foaming index = 1000/ a. where, a= the volume in ml of decoction used for preparing the dilution in the tube wherefoaming to a height of 1 cm is observed.
- **Florescence analysis -** the fluorescence character of the plant powders (40 mesh) was studied both in day and UVlight (254 and 366 nm) and after treatment with different reagents like sodium hydroxide,picric acid, acetic acid, hydrochloric acid, nitric acid, iodine and ferric chloride.
- **Extraction and preliminary phytochemical screening-**The shade dried powdered of leaf and stem were subjected to sequential soxhlet extractionusing various solvents of different polarity such as petroleum ether, chloroform, methanoland water to get respective extracts. The extracts were filtered individually, evaporated todryness and the percent yields of all the extracts were determined. These different extractswere subjected to qualitative tests for the identification of various phytochemical constituentslike alkaloids, steroids, terpenoids, flavonoids, tannins, saponins, carbohydrates etc. as per the
- **Standard procedure-**
  - **Thin layer chromatography** (TLC) profile-TLC studies of Petroleum ether, chloroform, methanol and ethanol extracts were carried outin various solvents at room temperature using Silica gel G as an adsorbent.

Observation & Results–

A. Morphological Characters-

1. **Colour:** Brown to reddish-brown.
2. **Odor:** Characteristic smell.
3. **Texture & Appearance:** Appears as coarsely powdered or granulated particles of variable sizes. Non-uniformgranules with an irregular surface texture.
4. **Particle:** Medium to coarse powder Some particles appear rounded while others areflake-like

B. Microscopical Characters-

1. Staining reagent- Phloroglucinol + HCl

- Fibers: Long, narrow, and lignified fibres are visible.
- Parenchyma Cells: Irregularly shaped, thin-walled cells present. Appear loosely arrangedand numerous.
- Fragments of Vessels: Reticulate or spiral thickenings are visible on some elements, suggesting xylem tissue.

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- Dark-Brown Structures: Possibly tannin cells or resin-containing structures.

2. Picric acid-

- Yellow-Stained Elements: Indicates the presence of fibres, xylem elements, or supportivetissues.
- Fibrous and Elongated Structures: Some elongated elements with linear orientation arevisible, likely to be sclerenchymatousfibres or vessel fragments. These are consistent withtissues from woody or bark plant parts.

C. Extractive values Formula-[7]

Weight of extract / Weight of crude drug x 100

1. Alcohol soluble extractive values- 0 .33/4 × 100 = **8.25%**
2. Water soluble extractive values- 0.2/4 × 100 = **5**

D. Physicochemical Parameters[7]

Qualitative Phytochemical Analysis Detail of results of phytochemical screening of extracts of leaf and stem have been shown in following Table.

	Test	Observation	Inference
	Detectionof Carbohydrates		
1	**Molish Test-** Add 2-3 drops of alcoholic solution of 1% 1-naphthol in test tube 'A' and then pour 2 mL conc. H2 SO4 down the sides of the test tubes that it for separate layer at the bottom of the test tube. The **formation** of apurplering at the inter face of the two layers confirms the presence of carbohydrates.	Purpleringatthe junction of two liquids	Carbohydrate's present
2	Fehling'stest- Mix 1 mL each of Fehling's solutions A and B in a test tube and add the mixture to test tube B. Heat the content of the test tube on a water bath. The formation of a orange-red precipitate indicates the presence of reducing sugar	Reddish ppt	Reducingsugar present
3	Benedict test - Add 1 mL of Benedict's reagent to test tube C and heat the mixture to boiling in a water bath for 2 minutes. The formation of anorange red precipitate due to the formation of copper (I) oxide indicates the presence of reducing sugar.	Reddish ppt	Reducingsugar present
	Detectionof Protein		
1	Biuret test - Prepare 0.5% (w/V) solution of casein or egg albumin in 0.1 M NaOH solution. Take 2-3 mL of the solution and add about 2 mL of 10% sodium hydroxide solution to it. Add a few drops of copper reagent and warm the mixture for about 5 minutes. Appearance of violet colour due to the formation of a complex species of Cu2+ ions with - CONH – group confirms the presence of protein in the sample.	Solution do not changetoReddish purplecolor	Proteinabsent

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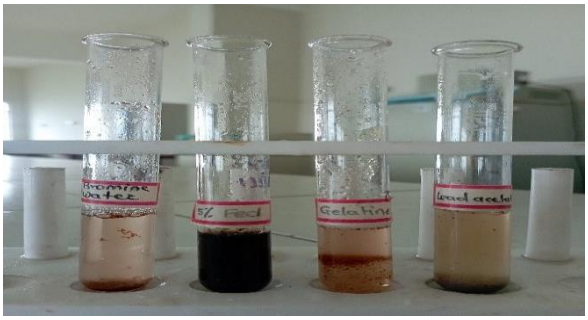
2	Ninhydrin test- Take 2-3 mL of an aqueous solution of egg albumin in a test tube. Add 3-4 drops of ninhydrin solution to it and heat. Appearance of blue colour indicates the presence of protein.	Solutionchange to Purple color	Aminoacid present
3	Millon's test - Take the sample solution or a 1% tyrosine solution in a test tube. Add about 2 ml of Millon's reagent to the test tube. If no immediate color change is observed, heat the test tube gently in a water bath for about 2 minutes.	Formationofapink tobrick-red solution	Tyrosinepresent



E. TLC-

Mobile Phase – methanol:ethylaceate (5:5)
Stationary phase–TLCSilicagel60F254plate
Visualization–bothbyUVcabinetandIodinechamber
Rf Value= Distance travelled by solute
Distance travelled by solvent.
Rf value= 4.2/5.3
Rf value = 0.79

DISCUSSION:

The present study was undertaken to establish pharmacognostic standards and evaluate the phytochemical profile of the bark and thorns of *Shalmali* (*Bombax ceiba* Linn.), an important medicinal plant widely used in traditional Indian medicine. Pharmacognostic standardization is essential for ensuring the identity, purity, and quality of crude drugs, particularly those used in polyherbal formulations. Morphological

evaluation of the powdered drug revealed characteristic features such as brown to reddish-brown color, characteristic odor, and coarse, non-uniform granules, which serve as preliminary identification markers. Microscopical analysis further supported authentication by demonstrating lignified fibers, parenchyma cells, vessel fragments with spiral and reticulate thickenings, and tannin-containing cells. The positive staining reactions with phloroglucinol–HCl and picric acid confirmed the presence of lignified tissues and supportive elements, which are typical of woody bark and thorn structures. Physicochemical parameters such as total ash, acid-insoluble ash, water-soluble ash, extractive values, loss on drying, and pH are important indicators of drug purity and quality. The observed extractive values showed higher solubility in alcohol than in water, indicating the predominance of moderately polar phytoconstituents. These parameters can be used as reference standards for quality control of *Shalmali* bark and thorns. Preliminary phytochemical screening revealed the presence of carbohydrates, reducing sugars, amino acids, flavonoids, tannins, steroids, and other secondary metabolites, while proteins were absent. The presence of flavonoids and tannins supports the traditional use of *Shalmali* in skin disorders, inflammation, wound healing, and acne, owing to their antioxidant and astringent properties. TLC profiling further confirmed the presence of distinct phytochemical constituents, with an Rf value of 0.79 indicating good separation and consistency of active components.

Overall, the findings of this study provide scientific validation to the traditional claims of *Shalmali* and contribute valuable baseline data for its standardization and future pharmacological investigations.

CONCLUSION:

The results presented in this study could serve as diagnostic parameters for proper identification as well as preparation of a monograph on *ShalmaliKantaka (Bomax ceiba. Linn).* On the basis of all available classical and contemporary references, we may conclude that all medicinal values of *Shalmali*are true in nature. The pharmacological studies had validated potency of this plant against diseases. In this study the presence of potent active chemical constituents indicates that aerial part *of Shalmali*i.e., *ShalmaliKantaka (Bomax ceiba. Linn)* could serve as useful compound for development of different Ayurvedic as well as Modern medicines.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this research paper.

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