PHARMACOGNOSTIC AND PHYTOCHEMICAL STUDY OF LEAF OF GAMBHARI (Gmelina arborea Roxb)

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ABSTRACT

Gambhari (Gmelina arborea Roxb) is a fast growing deciduous tree, having vast medicinal importance and is one of the ingredients of dashamoola used in Ayurveda. As Dashamoola has kapha vata hara property and is well known in treating vata vyadhi, Gambari being the member of dashamoola is also said to have similar properties. Any plant which is used medicinally requires detailed study prior to its use because for the purpose of identification of the plant, to avoid the admixture of other drugs and also for its therapeutic efficacy the present study was undertaken to lay down pharmacognostical and physicochemical standards for Gambhari leaf. Pharmacognostical study reveals Moisture content in leaf of Gambhari was found to be 12.55%. Total ash value was 0.50% and Acid insoluble value was nil. Extractive value was 1.14% and 11.03% of alcoholic and aqueous extract respectively. Microscopic and Macroscopic evaluations were done. Phytochemical screening showed the presence of Alkaloids, Carbohydrate, coumarins, steroids, Tannins. The results of the study can serve as a valuable source of pharmacognostic information as suitable standards for its identification.

Keywords: Gambhari, Gmelina arborea Roxb, Macro-macroscopic, Physicochemical standards

INTRODUCTION

Gambhari (Gmelina arborea Roxb) is one among the ten drugs included under Dasha-moola by the Brihatrayees. In clinical practice roots and fruits of this plant are most commonly used for medicinal purpose. In Charaka Samhitha various references regarding different parts of Gambhari are available. Gambhari Patra shaka are used in Raktapittahara chikitsa¹ and gambhari patra swedana in shotha chikitsa.² The leaf juice is externally used to treat the vrana.³ According to Bhavaprakasha nighantu Gambharipatra is snigdha⁴ and, ac-
According to Kaiyadeva nighantu Sriparni Rasa is Madhura, tiktha, Kashaya, Guru guna, Ushna veerya and it is having karma Trashnara, Amashulahara, Vishahara and arshohara.5 Gambharipatra as a folklore medicine is used by traditional vaidhyas for various therapeutic purposes especially in the management of Janu sandhigata vata.

Gambhari is a deciduous tree found scattered in deciduous forest towards greater part of India and the Andamans upto an altitude of 5000ft it is a deciduous tree; branchlets tomentose. Leaves up to 20 ×15cm, deltoid-ovate, acuminate at apex, subcordate and slightly decurrent at base, glabrous above, tomentose beneath; petioles upto 12.5cm long. Flowers on the naked branches or appearing with the young leaves, in small cymes of 1-3 flowers each, arranged in terminal tomentose panicles. Calyx c.5mm long, tomentose. Corolla upto 4cm long, brownish–yellow, pubescent. Drupel yellow when ripe, ovoid or pyriform. Not common. The wood is suitable for furniture, planking and other purposes.

Flower: January-February. Vernacular name: Shivani (Kan).6

The leaf of Gambhari can be easily adulterated with low grade material (substandard) if the supply of crude drug is inadequate. Pharmacognostic study is the initial step to confirm the identity and to assess the quality and purity of crude drug. The adulteration of the crude drug can be prevented by means of its evaluation like macro-microscopic study. Microscopy is an indispensable tool for authentication of crude drug and study of powdered drugs. Morphology and anatomical description of crude drug is of utmost important to find out adulterants of commercial significance. Setting up a standard of pharmacognostic, morphological and microscopical characters of leaf of plant of Gambhari will boost standardization, which can promise quality, purity and identity of samples7.

**MATERIALS AND METHODS**

**Sample collection**
The plant source was identified in the field (Shri Dharmasthala Manjunatheshwara College of Ayurveda, Udupi and nearby areas) with the help of regional floras (Udupi flora). The leaf were collected, dried and made into Choorna form. The choorna was packed in labelled plastic covers.

**Macroscopic evaluation**
Various macroscopic characters of fresh leaves of Gambhari were recorded such as type of leaf base, presence or absence of petiole and characters of lamina. Lamina consists of characteristic features such as composition, incision, shape, venation, margin, apex, base, surface and texture. The leaf is morphologically studied for its size, shape, fracture and configuration.

**Microscopic evaluation**
Sample was preserved in fixative solution. The fixative used was FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml). The materials were left in FAA for more than 48 hours. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with safranin. The slides were also stained with iodine in potassium iodide for detection of starch. Transverse
sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss Axio Cam camera under bright field light. Magnifications of the figures are indicated by the scale-bars.

**Powder microscopy**
Pinch of leaf powder previously sieved is put on the slide and mounted in glycerine and powder charcters are observed under the Zeiss AXIO trinocular microscope attached with Zeiss Axio Cam camera under bright field light.

**Physicochemical standardization**
Organoleptic examination, macromicroscopy, and physicochemical studies, viz., total ash, water-soluble ash, acid-insoluble ash, water- and alcohol-soluble extractive, loss on drying at 105°C as per standardized methods [8].

**Phytochemical analysis**
Preliminary phytochemical screening was carried out using the standard procedure [9].
The alcoholic extract of the leaf was analyzed for the presence of phytochemical constituents such as Alkaloids, Carbohydrate, Steroids, Phenols, coumarins, Carboxylic acid, Sap- nins, Terpenoids, Tannin etc.

**Thin-layer chromatography**
**Sample preparation**
*Gmelina arborea leaf extract* (1 g) was extracted with 10ml of ethanol (90%) and filtered. The filtrate was made up to 10ml with solvent in a standard flask.

**Mobile phase**
The solvent system containing Toluene: Ethyl acetate (9.0: 1.0) gave optimum separation in alcohol extract hence was used for the TLC study.

**Method**
Alcoholic extract of *Gmelina arborea* 3 l, 6 l, 9 l was applied on aluminium plates pre-coated with silica gel 60 F_{254} of 0.2mm thickness (Merck, Darmstadt, Germany) Using CAMAG LINOMAT 5 applicator. The plates were developed in the CAMAG glass twin trough chamber previously saturated with the mobile phase. The plate was derivatized using vanillin sulphuric acid (VS) and heated at 105°C till the spots appeared. The developed plates were visualized in the CAMAG visualizing chamber. Rf values were put manually.

**OBSERVATION AND RESULTS**
**Organoleptic characters:**
Leaf of *Gambhari* was leathery in touch with green color, sweet and bitter in taste. Leaf powder (Choorna) was coarse in appearance, green in color, astringent in taste and non irri- tant smell.

**Macroscopic characters**
Leaves measures up to 20cm in length and 15cm in width, broadly ovate and acuminate in apex. Leaf margin is entire, upper surface glabrous when mature, lower surface is clothed with fulvous stellate hairs. Base is subcordate and slightly decurrent. Petiole measures up to 19cm in length, cylindric/puberulous and glandular at the top.
Figure 1: Macroscopy of leaf of Gmelia arborea

Microscopic characters

Fig 2a. T.S of Gmelina arborea

Fig 2b. Midrib enlarged

Fig 2c. Upper region of midrib enlarged

Fig 2d. Pith enlarged
Upper epidermis: Single layered cells are rectangular with cuticularized outer walls. Trichomes both covering and glandular are seen. Covering trichomes are uniseriate, multicellular and blunt at the apex. Mesophyll is differentiated into palisade and spongy parenchyma. Palisade single layered, compact and cells are radially elongated. Spongy parenchyma many layered, loosely arranged with intercellular spaces, without the presence of cluster crystals. Lower epidermis is identical to upper epidermis. Numerous trichomes are seen on the lower epidermis.

Midrib
Epidermal layer of lamina are continuous in the midrib region also. Strips of collenchymas appear below the upper and above the lower epidermis. Central region of cortical parenchyma is a collateral bundle. Patch of Pericyclic fibres covers the phloem.

**Powder microscopic characters**
Powder microscopic characters showed the presence of mesophyll cells, epidermal cells in surface view, trichomes, mesophyll cell with fibres bundle of fibres and starch grains.
Physicochemical parameters
Moisture content in the leaf was found to be 12.55%, Total ash 0.50%, Acid insoluble ash 0.0%, water soluble ash 0.50%, alcohol soluble extractive value 1.14% and water soluble extractive value 11.03%.

Phytochemical test
Phytochemical test carried out showed the presence of alkaloid, steroid, carbohydrate, tannins and coumarins.

TLC fingerprinting
TLC fingerprint carried out in the alcoholic extract of leaf under short UV showed one spot with the Rf of 0.87 (L. green), Under long UV 8 spots with different fluorescent colour intensities with Rf of 0.34, 0.41 (F. Pink), 0.48(F. aqua blue), 0.57, 0.65, 0.78, 0.87 (All fluorescent red), 0.82 (F. Blue) among which 0.87 was detected in both short UV and long UV. Following derivatisation with vanillin sulphuric acid there were no spots observed.
Figure 4: HPTLC photo documentation of ethanol extract of *Gmelia arborea* leaf extract

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<th>Short UV</th>
<th>Long UV</th>
<th>Post derivatisation</th>
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Track 1: *Gmelia arborea* – 3µl  
Track 2: *Gmelia arborea* – 6µl  
Track 3: *Gmelia arborea* – 9µl  

**Solvent system** – Toluene: Ethyl Acetate (9.0: 1.0)

**DISCUSSION**

Ethnobotanically, the leaves of this plant *Gambhari* were used on folklore for the treatment of various ailments without standardization. The standardization of a crude drug is an integral part of study of drug in the present era due to non availability of raw drugs in various places leading to adulteration. Transverse section of leaf showed upper epidermis, lower epidermis, midrib and lamina. Phytochemical screening showed the presence of Alkaloids, Carbohydrate, coumarins, steroids, Tannins. Although alkaloids act on a diversity of metabolic systems in humans and other animals, they almost uniformly evoke a bitter taste. Alkaloids are quite diverse, they are narcotic used to relieve pain, analgesics some are used as muscle relaxants [10] *Gambhari* is having *tikharasa* and its function is to relieve the pain. It is *shoolahara*. Alkaloids Carbohydrates are building blocks they are nutritional elements required to serve energy. Plants steroids are anti-inflammatory effect due to this it has helpful in reducing the pain [11].*Gambhari* is useful in treating *ama* and shoola. Plant sterols act as a nutritional supplement; they block cholesterol absorption sites in the intestine helping to reduce cholesterol in humans. Steroids are anabolic in nature they promote bone density and muscle growth [12]. According to Ayurveda mostly joint and muscle pains are caused by the
aggravation of vatadosha Vata stana in asthi dhatu. Gambhari is said to pacify vata dosha. Tannin substances are present in many species of the plant they play a role in protection from predation. The astringency from the tannin is dry and sour feeling in the mouth. Tannins are antiseptic on skin and mucus membrane, they are used as healing agents in inflammation, leucorrhoea, gonorrhoea, piles, burns etc [13]. The Kashaya rasa of the plant is due to presence of tannins. Coumarins are found to be having anti-inflammatory action. Some coumarins are reported to be useful in the treatment of lymphedema [14].In classical references Gambhari is mentioned in shothahara dashemani.

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CONCLUSION
Srimanthi Parnyani asyaha. Leaves of Gambhari are beautiful. Gambhari is having Shothahara action according to classics. Gmelina arborea is the botanical source of Kashmari. The description of the drug, its synonyms, distribution, various properties and actions are presented as per the classics and other recent text books. Gambhari patra swedana in Shotha and Gambhari patra swarasas in Vrana is explained in classics. There is no particular reference of Gambhari patra kashaya in Janusandhigata vata. Gambhari patra is snigdha and sheetala. Its swarasas is Kashaya, Tikta and Madhura. It is having Ushna veerya and Katu vipaka.

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The results of the study can serve as a valuable source of pharmacognostic information as suitable standards for its identification
And also can be taken as reference for future studies.

REFERENCES

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