LIST OF PUBLICATION
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Preliminary phytochemical screening, pharmacognostic and physicochemical evaluation of leaf of *Gmelina arborea*

Daya L. Chothani*1, N. M. Patel 2

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**Article info**

Article history:
Received 17th June 2012
Received in revised from 5 September 2012
Accepted 7 December 2012
Available online 28 December 2012

**Keywords:**
*Gmelina arborea*
Preliminary Phytochemical Screening
Leaf constant
physicochemical stoma

**Abstract**

**Objective:** The aim of present study was to carry out preliminary phytochemical screening, detailed pharmacognostic profile and physicochemical evaluation of leaf of *Gmelina arborea*. 

**Methods:** Fresh leaf and dried powder of the leaves were studied by morphology, microscopy, preliminary phytochemical screening, and florescence analysis of powdered drug. Other physicochemical parameters were also performed as per WHO guide lines. 

**Result:** The detailed microscopy revealed that the presence of amomocytic stomata and covering uni-multicellular trichome. Leaf constant such as stomatal number, stomata index, vein islet number, vein termination number were also determined. Physicochemical parameters and florescence analysis were also studied. The preliminary phytochemical screening showed the presence of steroid, triterpenoid, saponin, protein, phenolic compound, flavanoid and carbohydrates. 

**Conclusions:** The result of these studies could be useful for correct identification and detection of adulterants of this plant material.

**1. Introduction**

*Gmelina arborea* is an unarmed, moderately sized to large deciduous tree, about 30 m or more in height and a diameter of up to 4.5 m. Leaf is used as carminative, in headache, in anasarca, asthma, bronchitis, cholera, colic pain, dropsy, epilepsy, phthisis, rheumatism, small pox, sore, spleen complaints, syphilis, throat swelling, urticaaria, as antidote to snake bite and some other poisons, cough, gonorrhea. Leafpaste is applied in on wounds. Charaka prescribed a paste of the leaves as ingredients of a medicated clarified butter for stiffness of the back, facial paralysis; prescribed the soup of fruits in diarrhoea. A paste of leaf is applied to the head for the relief of headache in fever. [1–3] The leaves are used in dyspepsia, cough, wound treatment, [4] Leaf paste in cephalgia and foul ulcer. [5] The juice of leaf is used as foetid discharge, worm from ulcers, demulcent, [6] diabetes and antidote. [7] Leaf has reported anthelmintic activity [8] and antimicrobial activity. [9] The current study was carried out to provide requisite pharmacognostic details, phytochemical aspects and preliminary phytochemical screening of leaf of *G. arborea*.

*Figure 1. Plant of Gmelina arborea*
A Review on *Gmelina arborea* Roxb. (Gambhari) 

**Traditional Uses, Phytochemical Constituents, Pharmacological Activity, Marketed Formulation**

Daya L Chothani1, H U Vaghasiya2, N M Patel3

**Abstracts:** *Gmelina arborea* Roxb. (*Verbenaceae*) is commonly known as gambhari. Gambhari is one of the herbs mentioned in all ancient scriptures of Ayurveda, as one of the member of *brhat pancamulas*. *Acaarya Vagbhata* has cited gambhari, one of the members from the group dasamulas, used in vata dosa (vata samsamana). It is traditionally used as diuretic, tonic, aphrodisiac, alternative astrigent to the bowels, promote growth of hairs, useful in treatment of anaemia, leprosy, ulcers and vaginal discharge, alopecia, anemia, etc. It is reported to contain alkaloid, glycoside, lignan derivative compound, sesquiterpenoid, flavanoid. Present review summarizes the traditional uses, phytochemistry, reported pharmacological activity and marketed formulation of *Gmelina arborea*.

**Key Words:** *Gmelina arborea* Roxb., Marketed formulation, phytochemistry, traditional uses.

**INTRODUCTION**

*Gmelina arborea* is an unarmed, moderately sized to large deciduous tree, about 30 m or more in height and a diameter of up to 4.5 m. The genus was named after J.C. Gmelin, an 18th-century German botanist. The specific name means treelike, from the Latin ‘arbor’ (tree). The great sage Charaka has categorized gambhari as sothahara – relieves cough, etc. The great sage has *Charaka* name means treelike, from the Latin ‘arbor’ (tree). The genus *Gmelina* has numerous synonyms like kasmari – a beautiful tree, srirpani- has beautiful leaves, madupanrika- has leaves with sweetish taste, pita rohini – has yellow flowers.

**Botanical Description**

**Bark**

It is smooth, pale ashy-grey or grey to yellow with black patches and corky circular lenticels. Internal surface of bark is brown coloured, exfoliates into thick woody plates or flakes.

**Leaves**

They are opposite-decussate, petioles cylindrical, 5-15 cm long, leaf blades broadly ovate, 10-25 cm x 7-20 cm wide, apically long acuminate or caudate, entire on mature plants but strongly toothed or lobed on young plants, usually cordate or truncate basally, with a short cuneate attenuation into the petiole, densely tomentose above when young, becoming glabrous above when mature, permanently densely fulvous-tomentellous with stellate hairs beneath, glandularous just above the petiole on the basal attenuation.

**Flowers**

Flowers are abundant, scented, reddish, brown or yellow, in terminal and axillary 1- to 3-flowered cymes on the panicle branches, which are about 8-40 cm long. Flower 2.5-5 cm in diameter; bracts 8 mm long, linear lanceolate; calyx broadly campanulate, about 5 mm long, densely pulvinate-mentosely externally, the rim with 5 small, triangular, acute teeth; corolla large, showy, varying from yellow to orange or brilliant orange to reddish- or brownish-yellow, dull yellow- brown, tubular below, obliquely funneled-form at the throat, the tube densely pubescent externally, the limb 2-lipped, the upper lip often orange-pink, deeply divided into 2 oblong, obtuse, backwardly curved lobules, the lower lip often lemon yellow, up to twice as long as the upper and 3-lobed.

**Fruit**

It is a drupe, 1.8-2.5 cm long, obovoid, seated on the enlarged calyx, glossy and yellow when ripe; exocarp succulent and aromatic endocarp bony and usually 2-celled. Seeds are 1-3, lenticular, exalbunimous.

**Taxonomical profile**

**Kingdom:** Plantae  
**Division:** Magnoliophyta  
**Class:** Magnoliopsida  
**Order:** Lamiales  
**Family:** Verbenaceae  
**Genus:** Gmelina L  
**Species:** *Gmelina arborea* Roxb. (8)

**Synonym(s)**

*Gmelina arborea* Roxb. var. canescens Haines  
*Gmelina arborea* Roxb. var. glaucescens C. B. Clarke  
*Gmelina rheedia* Hook.

**Common Names(s)**

Burneese: mai saw, yemane, yemani, yemari  
English: beechnwood, gemina, goomar teak,  
Kashmir tree, white teak.  
French: gemina, melina, peuplefer d’Afrique  
German: Gumar-Teak  
Nepali: gamari, gambari, gumhari, khamari  
Bengali: gamari, gambar, gumbar  
Gujarati: Shewan, Sivam

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Pharmacognostic Study of Fruits and Seeds of *Careya arborea*

**Daya L Chothani**¹, N M Patel²

**Abstract:** *Careya arborea* Roxb (Lecythidaceae) is commonly known as “kumbhi”. The aim of present study was to carry out morphology, microscopy and physicochemical parameter of fruits and seeds of *Careya arborea*. The detailed microscopy of fruits revealed that the presence of sclereids and fibers. The detail histology of seed shows starch grain and stone cells. The result of these studies could be useful for correct identification and detection of adulterants of this plant material.

**INTRODUCTION**

*Careya arborea* (Lecythidaceae) Roxb is medium sized deciduous tree, used medicinally in Cambodia and Australia (Kritirkar and basu). Traditionally fruits are aphrodisiac and cure kapha in Ayurveda. Fruits are astringent and demulcent, [1-3] Fruit is reported to contain dihydroxybenzoic acid (Gallic acid, kaempferol 3-O-ucopyranoside, quercetin 3-O-glucopyranoside and quercetin 3-O-(6-O-glucopyranosyl)-gluco pyranoside, [4] The fruits are edible. The fruits are eaten at the time of fast in some festivals like Mahashivratri. [5-7] fruits are astringent, decoction of fruits are used to promote digestion [8] and fruit are used in Snake bite, fever, [9-10] Fruits and leaves reported antioxidant activity, [11] The entire plant is used in traditionally in treatment of various disorders. Pharmacognostic study was reported on stem, leaves, bark and stem bark, [11-13] However systematic study is not reported on fruits and seeds. Therefore present study is carried out for correct identification of this plant.

**Figure 1:** Plant of *Careya arborea*

**MATERIAL AND METHODS**

**Plant Material**

Fresh leaves and fruits, seeds of *C. arborea* were collected from Vadodara in the month of May-June 2012. Plant was identified and authenticated by Dr. P. S. Nagar at Botany Department of The M. S. University, Vadodara. Voucher specimen (DC-CA-2) was stored in herbarium of our laboratory. Leaves, seeds and fruits were separated, dried under shade and powdered.

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**Reagent and Chemicals**

All the chemicals and reagents used were of analytical grade, purchased from Sigma chemical co. (St Louis, MQ, USA) and Merck (Darmstadt, Germany).

**Pharmacognostic Study**

Seeds and fruits were subjected to morphological examinations. Microscopic evaluation was carried out by taking the transverse sections using standard procedures [14-19] and then subjecting them to microscopic examination. The powdered samples were also subjected to histological examinations using standard procedures and their diagnostic features were identified and recorded and observed under zeiss microscope using mips olympus camera. different diagnostic features were identified and reported in the results.

**Physicochemical Evaluation**

The various physicochemical properties like water soluble extractive value, alcohol soluble extractive value and loss on drying were determined as per WHO guidelines. [20]

**RESULTS AND DISCUSSION**

**Morphological Study**

Morphological characters of fruits and seed are reported and compared with reported character in Figure 2.

1. **Fruits**

Fruits are fleshy indehiscent, Green when unripe, greenish yellow when ripe. 1.9- 2.5 cm length and 1.2-1.5 cm width, Globose, Taste: astringent, Odour: Characteristic, agreeable. Fruits are crowned with calyx limb.

2. **Seed**

The mature Seeds are Exaluminious while immature seeds are albuminous , oval ellipsoid or oblong. Externally Dark brown, Internally, Creamish white, taste: oily, astringent, 1.5 to 2 cm length, 1- 1.2 cm thickness, Odour: Characteristic pleasant.

**Microscopical Characters**

1. **Microscopic Characters of Fruit of *Careya arborea***

Transverse section of the fruit showed single layered epidermis covered by a cuticle; followed by few layers of compactly arranged hypodermal cells. Major portion of fruit is occupied by fleshy mesocarp. Mesocarp is composed of thin walled, oval to polygonal parenchymatous cells. Lignified fibers and thick walled sclereids are scattered in mesocarp. Vascular bundles are embedded in throughout parenchyma (Figure 3 and Figure 4).

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**Inventi Rapid: Planta Activa Vol. 2013, Issue 2**

[ISSN 2278-411X] © Inventi Journals (P) Ltd Published on Web 20/01/2014, www.inventi.in
Pharmacognostic and Physicochemical Evaluation on Fruits of Gmelina Arborea

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ABSTRACT
The aim of present study was to carry out pharmacognostic and physicochemical evaluation of fruits of Gmelina arborea. Fresh fruits and dried powder of the fruits were studied by morphology, microscopy, qualitative chemical test and florescence analysis of powdered drug. Other physicochemical parameters were also performed as per WHO guide lines. The detailed microscopy revealed the presence of stone cells, vascular strand and pitted parenchyma. Physicochemical parameters and florescence analysis were also studied. The preliminary phytochemical screening showed the presence of alkaloids, proteins, saponins, sterols, phenolic compounds and carbohydrates. The result of these studies could be useful for identification and standardization of Gmelina arborea fruits.

Keywords: Gmelina arborea, Fruit, Phytochemical Screening, Physicochemical

INTRODUCTION
Gmelina arborea Roxb. belongs to family Verbenaceae, widely distributed in India, Ceylon, Malaya and Philippine Island. In Ayurveda, fruits are acrid, sour, bitter, sweet, cooling, diuretic, tonic and aphrodisiac. It promotes hairs growth, used in ulcers, anemia and leprosy. Fruits are reported butyric acid, tartaric acid, and saccharine substances. Chakradatta gave ripe fruits with honey for checking hemorrhage. Ripe fruits dried and cooked with cow’s milk, for urticaria. Fruits used in dysuria, hemorrhagic disease¹⁻⁶ The fruits are reported hepatoprotective,⁷ antibacterial, antioxidant and antidiabetic activity.⁸ The current study was carried out to provide pharmacognostic details, physicochemical and phytochemical analysis of fruits of Gmelina arborea

MATERIAL AND METHODS
Plant material
Fresh fruits of G. arborea were collected from Vadodara in the month of May-June 2011. Plant was identified and authenticated by Dr. P. S. Nagar at Botany Department of The M. S. University, Vadodara. Voucher specimen (DC-GM-1) was stored in herbarium of our laboratory. Fruits pericarps were separated dried under shade and powdered.

Reagent and Chemicals
All the chemicals and reagents used were of analytical grade, purchased from Sigma chemical co. (St Louis, MQ, USA) and Merck (Darmstadt, Germany).

Pharmacognostic study
Fruits were subjected to morphological examinations. Microscopic evaluation of fruit...
Careya arborea Roxb.: Phytochemical Constituents, Ethnobotanical Uses and Biological Activity

Daya I. Chothani*, HU Vaghasiya2, NM Patel3

Abstracts: Careya arborea Roxb (Myrtaceae) is commonly known as kumbhi. It is used in treatment of various diseases. Traditionally used in treatment of diarrhea, dysentery, bronchitis, fever, tumor, liver disorders, cough, colds, joint pain, Catarh, epilepsy, lecderma etc. It is reported to contain alkaloid, triterpenoids, flavonoids, coumarin, saponins and tannins. The present paper compiles traditional uses, phytoconstituents and pharmacological activity of Careya arborea Roxb.

Key Words: Careya arborea Roxb, Ethnobotanical uses, Phytochemistry, Biological activity.

INTRODUCTION [1-9]

Caryea arborea Roxb (Myrtaceae) is a large deciduous tree grows up to 20 meters in height, Leaves simple, alternate, ovate-ovobovalong and acute; flowers yellowish white, foul smelling, found in terminal spikes. Fruits are globose, large, green colored berries containing numerous embedded seeds. The leaves are turn in to red color in the cold season. It is the Kumbhi of Sanskrit writers, named on account of the hollow on the top of the fruit giving it somewhat the appearance of a water-pot. The bark of the tree and the calices of the flowers are well-known in Indian remedies. and are valued on account of their astrigent and mucilaginous properties, being administered internally in coughs and colds and applied externally as an embrocation. It states that wild pigs are very fond of the bark and that it is used by hunters to attract them. An astrigent gum exudes from the fruit and stem, and the bark is made into coarse cordage. The Tamil name Pata-tanni-maram signifies “water-bark-tree,” in allusion to the exudation trickling down the bark in dry weather.

Vernacular Names

<table>
<thead>
<tr>
<th>Hindi Name</th>
<th>Kumbhi,Kaloikathbi</th>
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<tbody>
<tr>
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<td>Patana Oak, Slow</td>
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<td>Match Tree, wild guava</td>
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<td>Kannada Name</td>
<td>Dolli, Kaulu</td>
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Taxonomical Profile

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<th>Kingdom</th>
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<tbody>
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<td>Division</td>
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Class : Magnoliopsida
Order : Lecythidales
Family : Lecythidaceae
Genus : Careya
Species : Careya arborea Roxb.

Morphological Description

Leaves

Leaves simple, alternate, glabrous, broadly obovate, apex obtuse with short tip, base attenuate into short petiole, margin finely toothed. Midrib is flat above, secondary veins obuse, widely parallel, tertiary veins oblique (ladder-like or percurrent). Stipules are absent.

Inflorescences or Flowers

Flowers yellowish green with red purple stamens. Flowers arranged in 1-10-flowered inflorescence, terminal on leafless twigs, bisexual, sessile. Stamens are numerous, twice as long as the petals, in three whorls, cream tinged purple-red at base. Flowering Season is summer.

Fruits

Fruits are Simple, Berry, Fleshy Fruit, up to 6 cm, skin leathery, pulp fleshy, not splitting. Fruiting Seasons is Monsoon.

Seed

Seeds, exalbuninous, dark brown, oval ellipsoid, 1.5 to 2 cm long, up to one cm or slightly above in width; indehiscent; testa hard and wrinkled; odour, pleasant; taste, astrigent. [14]

Bark

Bark was thick, rough, dark grey in colour, showed shallow cracks and exfoliating in narrow flakes. Bark was odourless with astrigent taste. The physical evaluation parameters C. arborea bark revealed total ash (12%), sulphated ash(9.49%), water soluble ash (2%), acid insoluble ash (0.9%), water soluble extractive value (16%), alcohol soluble extractive value (7.2%) and loss on drying (14%). [11]

Distribution

It is found in Afghanistan, Pakistan, India, Nepal, Burma (Myanmar), Malay Peninsula, Thailand, Indochina, Laos (Khammouan).

Ethnobotanical Uses

- It is uses in treatment of snake bites, Cold, Cough, Demulcent, Digestive, Emollient, Eruption, Fever, Fistula, Leech-Repellant,Poison, Prolapse, Pruritis, Smallpox, Sore. [12]
- Stem bark: Demulcent in cough and cold, Antipyretic, Antipuriritic, Eruptive fevers, Anthelmintic, Decoction...is bark used in diarrhoea, Eye diseases. Flower is uses as Aphrodisiac. Infusion of flower is given after child birth. Dried calyces are used as...[12]
- Stem bark: of Careya arborea was traditionally used in the treatment of...[12]
- The aqueous extract of fresh root bark used as fish poison. The tribal peoples of Kolhi Hills of Tamil Nadu used the stem bark of the plant for the treatment of various tumor and liver disorders. In fever, best wound healer-medicatied oil in sinus and fresh wounds.[15-16]
- It is used as emollient; it is applied to the wound in snake bite. Internally used in the form of infusion. Leaves made into poultice 3 to 4 times a day rapidly heal obstinate ulcers. Flower is given in sharbat or in infusion after child birth to heal rupture caused by child birth. Juice of the fresh bark as well flower is administered with honey as demulcent in cough and colds. Boils, abscesses and ulcers cleaned and washed with the decoction of the barks will heal rapidly. It also used in indigestion and dysentery.[17-18]
- Kumbhi Root 2g of fresh root paste is taken in the morning in empty stomach for five days against joint pain.
- Root-paste: in body pain. Root-bark decoction (with long pepper) : in fever, [Root-bark powder (paste with honey): to children in cold and cough: Root-bark (paste with margosa): in leucoderma]
- Bark juice is mixed with cow’s milk and taken orally 3 times a day, for dysentery with vomiting.