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Review Article

A PRECIOUS HERB - *GMELINA ARBOREA* LINN. W.S.R TO ITS MEDICINAL USES AND PHARMACOLOGICAL ACTIVITY

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ABSTRACT

Traditional medicines play an important role in health services around the globe. About three quarter of the world population relies on plants and plant product for health care. *Gmelina arborea* Linn. an important medicinal plant is one of the most widely cultivated species of the family *Verbenaceae*. It is commonly known as '*Gambhari*', the term actually used by tribal people of Bihar. It is one of the herb mentioned in all ancient literature of *Ayurveda* in diseases like ulcer, diarrhoea, thirst, anaemia, leprosy, vaginal discharge, piles, fever and varieties of ailments. It is highly valued from the immemorial because of its vast medicinal properties. *Gambhari* is a fast growing deciduous tree occurring naturally throughout greater part of India at altitudes up to 1,500 meters. It is an essential component of *Dashamula dravya* (group of ten roots) and has been used for its valuable medicinal properties like *Medhya* (Intellect power), *Keshya* (Hair tonic) and *Rasayana* (Rejuvenator). *Acharya Charaka* mentioned *Gambhari* in *Sothahara, Dahaprasamana, Virecanopaga mahakasaya* and also explain its fruit as best among *Rakta-Sangrahaka* and *Raktapittahara.* The roots, fruits and the leaves of *Gambhari* have great medicinal value therefore traditionally it was widely used as anthelmintic, antimicrobial, anti-diabetic, anti-aging, analgesic, diuretic, hepato-protective and antiepileptic agent. The present article provides all necessary information regarding its classical literature, general introduction, medicinal uses of its roots, leaves, flowers, fruit, bark, and pharmacological studies conducted till date.

KEYWORDS: *Gmelina arborea* Linn., *Gambhari, Dashamula, Medhya, Keshya, Rasayana.*

INTRODUCTION

In the Ayurvedic literature certain drugs have been clubbed together and given group names. *Dashamula* which literally means the ten roots is one such group. *Gmelina arborea* Linn. belonging to the family *Verbenaceae* is commonly known as '*Gambhari'. Gmelina* is one of the important genera of the family, consisting of about 33 species. It is a beautiful fast growing deciduous tree, which is a vital ingredient of the *Dashamuladi kwath* and *Bhrihat-panchamool* constitute a number of Ayurvedic preparation used as tonic[1]. It is popularly known as Coomb teak, Kashmeeri tree, Candahar tree in English. *Kasmerya* is considered as *Raksoghna* in nature as per ancient texts in India. *Gambhari* fruits is considered as a substitute for *Draksa* (grapes). It is *Brmhana, Vrsya* and *Rasayana* in nature. The root bark however is included in the *Sothahara* group and *Brhat-panchamula* group by *Caraka* and *Sushruta* respectively[2]. *Kaiyadeva* described its flowers as *Sangrahi* and *Vatavardhaka*[3]. The whole plant is medicinally very important. It promotes digestive power, improve memory, overcomes giddiness and is also used as an antidote for snake bite and scorpion sting. Roots are useful in hallucination, fever, dyspepsia, hyperdipsia, haemorrhoids, stomachalgia, heart diseases, nervous disorders, piles and burning sensation. Bark is used in fever and dyspepsia. Leaf paste is good for cephalagia and leaf juice is a good wash for foul ulcers and is also used in the treatment of gonorrhoea and cough. Flowers are recommended for leprosy, skin and blood diseases. The fruits are used for promoting the growth of hair and in anaemia, leprosy, ulcers, constipation, leucorrhoea and lung disease.

Wood of *Gambhari* is one of the best and most reliable timber in India. It is used for making furniture, planks, carriages, printing boxes, musical instruments, shafts, axles, picture frames, jute, callipers, ship buildings, artificial limbs and stethoscopes.[4]

Classical Review of *Gambhari*

Historical aspect

In ancient Indian literature like Vedas the synonyms of *Gambhari* like *Rohini, Kashmarya, Sriparni* etc have been described. For the first time the name *Rohini* was mentioned in *Atharva veda*, where it is considered as *Asthisansthapaka* and *Keetanunashaka.* The name *Kashmarya* is given in Shatapatha Bramhan, where it is explained as disinfectant, but the properties of which do not correlate with the *Gambhari.*[5]

In Samhita and Nighantu

Charaka - *Sothahara, Dahaprasamana, Virechanopaga mahakasaya* [6]

Sushruta - *Sarivadi, Brhat panchamula gana*[7]

Vagbhata - *Sarivadi gana*[8]

Bhavprakash nighantu - *Guduchayadi varg*[9]

Kaiyaideva nighantu - *Aushadhi varg*[10]

Raja nighantu - *Prabhadradi varg*[11]

Mahausadha nighantu - *Bilvadi varg*[12]

Dhanvantari nighantu - *Guduchayadi varg*[13]
Sodhala nighantu - *Guducyadi varg*[14]
Madanpala nighantu - *Abhayadi varg*[15]
Latin name – *Gmelina arborea* Linn.
Taxonomical Profile[17]

Gmelina – means name of the research scientist
arborea – means tree like
Family – *Verbenaceae*[16]
Synonyms – *Premna arborea* Roth.

Table 1: Showing Taxonomical profile of *Gmelina arborea* Linn.

Kingdom	Plantae	Plants
Sub kingdom	Tracheobionta	Vascular plants
Division	Magnoliophyta	Flowering plants
Class	Magnoliopsida	Dicotyledons
Order	Lamiales	
Family	*Verbenaceae*	
Genus	*Gmelina*	
Species	*Arborea*	

Regional name[18]

Table 2: Showing regional name of *Gmelina arborea* Linn.

Hindi	Gambari, Gambhar, Kambar, Khambhari, Khammara, Kumbhar Sewan, Shewan, Kumar
English	Candhar tree, Candahar tree, Coomb teak, Cashmeri teak, Gamari, White teak
Bengali	Gambhar, Gamari, Gumar, Gumbar
Assamese	Gamari, Gomari
French	Gmelina, Melina, Peuplier d Afrique
German	Gumar-Teak
Gujrati	Shivan, Savan, Sivan
Kannada	Shivanigida, Shivani, Kashmiri, Kumbala mara, Shewney, Kuli
Kashmiri	Kashmari
Malayalam	Kumil, Kumbili,
Marathi	Shiwan, Shewan, Gamar, Kamar
Oriya	Gambhari
Punjabi	Gumhar, Kumhar
Tamil	Kumishan, Kumizhen, Gumadi, Cummi
Telugu	Peggummudu, Peggummadi, Gumudu, Pedda-gumudu, Gumar-tek, Pedda-gomru, Tagumuda
Nepal	Gambari, Khamari
Konkani	Niuvon, Sivony
Kumaon	Khamara, Kumhar
Rajputana	Sewan
Sanskrit	*Ashveta, Bhadra, Bhadraparni, Gambhari, Gandhari, Gandharya, Sindhuparni, Kasmari, Shriparni, Krishnavrintika, Snigdhaparni, Mahabhadra, Madhuparanika, Gopabhadrika, Suphala, Vidarini.*

***Paryaya* and its Meaning (Synonyms)**[19]

Table 3: Showing *Paryaya* of *Gmelina arborea* Linn.

Kasmari	It is a beautiful tree
Mahakumbhi	Its tree like Kumbhi
Gambhari, Hira	It growing fastly
Kasmiri	It is found in Kashmir etc.
Sarvatobhadra	It is useful in many ways
Sthulatvaca	Bark is thick

Pitarohini	Its bark is yellowish in colour
Sriparni, Bhadraparni	Leaves are beautiful
Krsnavrnta	It has blackish petiole
Mahakusumaka	Inflorescence is long
Suphala	Fruits are wholesome
Hira	Fruits are used as *Rasayana*
Vatahrt	It is a good remedy for *Vatika* disorders
Madhuparni	Its leaves are sweet as honey or its leaves are glabrous, shining like honey

Botanical Description[20]

A moderate sized unarmed deciduous tree, reaching 18 m high, black greyish yellow, rather corky; branchlets and young parts clothed with fine white mealy pubescence.

Leaves – 10-20 by 7.5-15 cm, broadly ovate, acuminate, entire, glabrous above when mature, stellately fulvous-tomentose beneath, base cordate or sometimes truncate and shortly cuneate; petiole 5-7.5 cm. long, cylindric, puberulous, glandular at the top.

Flowers – appearing with or sometimes before the young leaves, usually in small cymes of about 3 flowers arranged along the branches of a densely fulvous-hairy panicle reaching 30 cm. long; buds clavate, angular; bracts 8 mm. Long, linear- lanceolate. Calyx - 5 mm. Long, broadly campanulate, densely fulvous- hairy; teeth 5, small, triangular, acute.

Corolla – brownish yellow, densely hairy outside, reaching 3.8 cm. long, 5-lobed, 2-lipped; upper lip rather more than 1 cm. long, deeply divided into 2 oblong, obtuse lobes; lower lip nearly 2.5 cm. long, 3- lobed, the middle lobe projecting forward, ovate, subobtuse, with irregularly crenulated margin, much longer and broader than the obovate rounded lateral lobes. Drupe 2-2.5 cm. long, ovoid or pyriform, smooth, orange-yellow when ripe.

Root – Cylindrical with uneven surface, greyish brown, fracture somewhat tough in bark, brittle and predominant in woody portion.

Root bark – Fresh mature root bark is yellowish in colour. Dry pieces curved and channeled, thinner ones forming single quills, external surface rugged due to presence of vertical cracks, ridges, fissures and numerous lenticels, fracture short and granular.

Stem – Hard, woody, smooth except for a few scars of branches, yellowish grey externally and cream coloured internally.

Stem bark – 0.2 to 0.7 cm thick, ribbed, quilled at some places, outer surface yellowish- brown in colour and rough due to some longitudinal and horizontal cracks, inner surface fairly smooth and reddish-brown to black in colour.

Substitute and Adulterants

Roots of *Gmelina asiatica* Linn. are used as substitute of *Gmelina arborea*[21]. *Acharya Bhavamisra* described *Ariyakasmar* or *Budhikasmar* (*Premna flavescens* Ham.) as a substitute of *Gambhari.* Leaves of *Premna flavescens* resemble the leaves of *Gambhari,* but sweet honey like smelling leaves of *Premna flavescens* and its small sized flowers and fruits, distinguishes it from *Gambhari*[22]. An another tree is described by Vaidya Bapalal which is used as *Shriparni* towards, Haridwar, these tree are *Trewia nudiflora* (*Pani- gambar*) belonging to the family *Euphorbiaceae* are found abundantly on the bank of the river Ganges and the bark of this is being used by the local *Vaidyas* as *Shriparni.*[23]

Botanical Description of *Trewia nudiflora*[24]

A large deciduous tree, bark smooth, pale grey, young shoots, leaves and inflorescence clothed with canducous, grey tommentum.

Leaves – opposite 15.23 by 11.5-18 cm ovate, entire, acuminate; base usually cordate, 3 or 5 nerved, glabrous when mature, glandular at the base near the top of the petiole, stipules minute.

Flowers – dioecious, petals 0, disk 0, male flowers yellow; sepals 3-5, concave, valvate; stamens numerous, free, on a convex torus. Female flowers green solitary or 2-3 together. Calyx – long flask- shaped, shortly 3-5 toothed, ovary 2-5 celled, villous, hidden by the calyx.

Fruit – drupaceous 2.5-3.8 cm diam. depressed- globose green, pericarp rather firm somewhat succulent, stone 2.5 celled.

Distribution

Plant is found wild throughout India from the foot of Himalayas to Kerala and Andaman, in moist, semi-deciduous and open forests up to an altitude of 1500m msl. It is generally found scattered in mixed forests of moist regions of the country extending up to comparatively dry regions of central India. Occasionally it occurs in evergreen as well as in the Sal forests. In the natural forest, the species is usually found scattered and in association with other species. It is found in dry mixed deciduous forest types in Central India.[25]

Chemical Constituents of *Gmelina arborea*[26]

Gmelo furan-a furanosesquiterpenoid, sesquiterpene, cerylalcohol, hentriacontanol-1, β-sitosterol, n-octacosanol, gmelinol, apiosylskimmin-a apiofuranosyl-(1-6)-β-Dglucopyranosyl (1.0.7)-umbelliferone.

Leaves – Luteolin, apigenin, quercetin, hentriacontanol and betasitosterol.

Root - cluytylferulate, n-octacosanol, gmelinol, arboreol, 2-0methyl arboreal, 2-0-ethylarboreol, isoarboreol, gmelanone, βsitosterol, paulownin, 6”-bromoisoarboreol, 4hydroxysesamin, 4,8-dihydroxysesamin, 1,4 dihydroxy-sesamin (gummadiol), 2-piperonyl-3 (hydroxymethyl)-4 (α-hydroxy-3-,4-methylenrdioxy-benzyl)-4hydroxy

tetrahydro furan (1), 4-epigummadiol-4-0-glucoside, 1,4-dihydroxy-2,6-dipiperonyl-3,7-dioxabicyclo [3,3,0]octane, gmelanone, palmitic, oleic and linoleic acids, stigmasterol, stigmastanol, campesterol, α-2-sitosterol, butulinol.

Fruit – Butyric and tartaric acids, saccharine substances and little tannin, β- sitosterol, ceryl alcohol, gmelinol, arborone, arboreal, luteolin, apigenin, quercetin, hentriacontanol, quercetogenin.

Stem – Lignans

Stem bark – Alkaloids in traces.

Propagation and Cultivation

Gmelina arborea Linn., is a fast growing plant due to its excellent medicinal and wood properties, is emerging as an important plantation species. Most potent and medicinally used part of this plant is its root part. This is the reason; the whole plant is being killed. Natural reproduction of *Gmelina arborea* Linn., takes place in rainy season soon after the drupes fall to the ground. Alternate heat and moisture are necessary to stimulate seed germination. Artificial reproductions may be carried out by direct sowing the seeds or by transplanting vegetative propagation. To reproduce a healthy progeny of *Gmelina arborea* Linn., there are certain agroclimatic conditions where the plant thrive, are to be followed. They include moist, fertile soil with good drainage. This plant is a light demander and intolerant of shade. It grows in areas receiving rainfall ranging from 750-4500mm or more. It does not thrive on ill-drained soils and remains stunted on dry, sandy or poor soils; drought also reduces it to a shrubby form. As these requirements plays prominent role in growth and production of *Gmelina arborea* Linn., they should be fulfilled and we should make sure that the plant grows in these conditions.[27,28]

Ayurvedic Properties And Pharmacological Effect

According to Ayurvedic literature, *Gambhari* is [2]

***Rasa* -** *Tikta* (bitter), *Kasaya* (astringent), *Madhur* (sweet)

***Gunu* (properties)**- *Guru* (heavy)

***Virya* (potency) -** *Usna* (hot)

***Vipaka* (metabolism) -** *Katu* (pungent)

***Karma* -** *Vata-pittahara, Bhedana, Sothahara, Dipana-pacana, Medhya.*

***Rogagnatha* –** *Brama, Shosh, Trisha, Ama, Shula, Arsha, Visha, Daha, Jwara, Raktashaya, Raktapitta, Motrakrichra, Kshaya, Chata.*

Properties of Fruit[29]

Rasa - Kashayamla, Madhura

***Gunu* -** *Snigdha* (unctuous), Guru

***Veerya* –** *Sheetha* (cold)

***Vipaka* -** *Madhura*

***Doshakarma* -** *Kaphapitta shaamaka, Vata vardhaka*

Karma (action) - *Hrudya*, *Rasayana, Brimhana* (nourishment), *Shukrala* (spermatogenic), *Keshya* (promoting hair growth), *Medhya, Mootrala* (diuretic), *Balya, Vishagna, Sandhaneeya*.

Properties of Flower[30,]

***Rasa* -** *Kashaya, Madhura, Tikta*

***Veerya* -** *Sheetha*

***Vipaka* -** *Madhura*

***Doshakarma* -** *Pittahara*

Karma - *Balya* (strengthening), *Vrushya.*

Research Studies

- **Antihelmintic activity**

  Alcoholic and aqueous leaves extracts of *Gmelina arborea* Roxb. exhibited anthelmintic activity in dose dependent manner giving shortest time of paralysis and death compared to piperazine citrate, especially with 100mg/ml concentration for Pheretima posthuma and Ascardia galii worms by increasing chloride ion conduction of worm muscle membrane that produced hyper polarization and reduced excitability that lead to muscle relaxation and flaccid paralysis.[31]

- **Antiulcer activity**

  Hydro-alcohol extracts of leaves of *G. arborea* when evaluated using experimentally induced ulcer in Wistar rats using different experimental models such as aspirin induced ulcer, pylorus ligation induced ulcers, and ethanol induced ulcers and cold restrain stress induced ulcers.[32]

  The Methanol extract of *G. arborea* showed anti-ulcer activity in pylorus ligation and ethanol induced ulcer models in Wistar albino rats. Extracts inhibits of the gastric lesions induced by pylorus ligation induced ulcer and ethanol induced gastric ulcer. The extract showed significant reduction in gastric volume, free acidity and ulcer index as compare to control.[33]

- **Antihyperglycemic activity**

  Ethanol extract of *G. arborea* leaf in streptozotocin induced male Wistar albino rats using glibenclamide as standard. The lipid profile such as TC, TG and LDL levels were significantly increased in diabetic control animals whereas HDL levels were decreased when compared to the control rats.[34]

- **Cardioprotective activity**

  Ethanolic extract of *Gmelina arborea* Roxb. has shown potential protective effect against doxorubicin (DOX) induced cardiactoxicity by increasing cardiac markers activities in plasma. The significant increase in the activities of cardiac markers such as SGOT (Serum glutamic oxaloacetic transaminase), SGPT (Serum glutamic pyruvic transaminase) and ALP (Alkaline phosphate test) in plasma of DOX (20mg/kg) treated rats might be due to enhanced susceptibility of myocardial cell membrane to the isoproterenol mediated peroxidation damage resulting in increased release of these diagnostic marker enzyme in to the systemic circulation[31]

- **Wound-healing activity**

  Alcohol extract of leaves powder of *G. arborea* used in incision, excision and dead space wound models in rats. The extract significantly increases the wound contraction rate, skin breaking strength, granuloma breaking strength, hydroxyproline content and dry granuloma weight and decrease in epithelization period was observed.[35]

- **Anti-Diabetic activity**

  Ethanolic extract of *Gmelina arborea* Roxb. bark at dose of 420mg/kg and chlorpropamide at dose of 200mg/kg ($p<0.05$) was found to reduce the increase of blood sugar in streptozotacin (50mg/kg) induced diabetes due to the increased blood GSH (Glutathione) levels reinforcing the role of GSH as free radical scavenger and in the repair of free radical caused biological damage.[31]

- **Hepatoprotective activity**

  Hepatoprotective activity of the aqueous extracts of bark and fruit of *G. arborea* against paraquat- and hydrogen peroxide induced oxidative stress using liver slice culture. [36]

- **Antimicrobial activity**

  Antibacterial activity on leaf and stem of bark extracts of *G. arborea* against Escherichia coli, Klebsiella pneumonieae, Proteus mirabilis, Shigella dysenteriea and Salmonella typhi.[37]

- **Anti-fungal activity**

  Antifungal activity of the heartwood of *G. arborea* against Trametes versicolor and Fomitopsis palustris using a sensitive bioassay system for antifungal activity against basidiomycetes has been developed which uses a medium in which homogenized hyphae has dispersed. Ethyl acetate solubles from the heartwood showed the highest activity, five constituents have been isolated and identified as (+)-7′-O-ethyl arboreol, (+)paulownin, (+)-gmelinol, (+)-epieudesmin and (−)-β-sitosterol. The four lignans showed antifungal activity, gmelinol has reported antifungal constituent.[38]

- **Antibacterial, antioxidant and anti-diabetic activities**

  The fruits of *G. arborea* possess antibacterial, antioxidant and antidiabetic activities evaluated on human pathogens like B. subtilis, S. aureus and Pseudomonas aeruginosa. In-vitro antioxidant activity of *G. arborea* fruits was studied by DPPH free radical scavenging and reducing power assay. The anti-diabetic activity of extracts was carried out using alloxan induced diabetic model of Wistar rats.[39]

- **In Vitro Cytotoxic activity**

  The ethanol extracts of *G. arborea* leaf has exhibited in vitro cytotoxic activity. In vitro cytotoxic tested against Colon cancer (COLO 201), Gastric cancer (HT-29) and Human oesophagel cancer (TE-2) cell lines using the thiazolyl blue test (MTT) assay. Antioxidant and cytotoxic activities of methanol extracts and the derived sub-fractions of 90% methanol extract of *G. arborea* leaves using DPPH antioxidant activity and reducing power assay. The cytotoxic activity was carried out via brine shrimp test and toward human cancer cell line; HepG2 using Sulphorhodamine-B assay. [40]

Traditional Uses[41,42,]

- The bark of *Gmelina arborea* are stomachic, galactogogue, laxative and anthelmintic, improves appetite, useful in hallucination, piles, abdominal pains, burning sensations, fever, '*Tridosha*' and urinary discharge. It is also recommended with other drugs for the treatment of snake-bite and scorpion-sting.
- Leaf paste is applied to relieve headache and juice is used as wash for ulcers. *Gambhar* leaves, *Apamarga* roots and bark skin of *Salmali* are mashed with cow's milk and are given orally to treat hyperacidity. The leaves juice, milk and sugar are recommended in inflammatory condition of urinary bladder and dysuria.
- Flowers are sweet, cooling, bitter, acrid and astringent which is useful in leprosy and blood diseases.
- Fruit is acrid, sour, bitter, sweet, cooling, diuretic, tonic, aphrodisiac, promote growth of hairs. The ripened fruit is valuable in heart disease of *Vata* imbalance.
- The roots are described in Ayurvedic texts as mild laxatives which treat flatulence and increase appetite, lactation and reliever of menstrual irregularities. The cold infusion of *Candana, Ustra* and *Gambhar* works well with sugar to alleviate the thirst. It is also useful in piles, burning sensation, fever and '*Tridosha*'.

Mode of use in different conditions[43]

- ✓ **Fever**

  Pittajvara **–** The cold decoction of *Kasmarya* mixed with sugar pacifies excessive thirst and burning sensation.

  Vatajvara **–** *Draksadi kvatha*

- ✓ **Diarrhoea**

  The soup of *Kasmarya* fruits added with sugar and a bit sourced is beneficial.

- ✓ **Bleeding piles**

  In excessive bleeding, *Khada* (a dietary preparation) prepared of *Kasmarya, Amalaka, Karbudara,* sour fruits, *Grnjanaka, Salmali, Dugdhika, Chukrika,* leaf-buds of *Vata* and *Kovidara* flowers along with supernatant fatty layer of curd should be given.

- ✓ **Intrinsic haemorrhage**

  1. Ripe fruit of *Udumbara* and *Kasmarya, Haritaki, Kharjura* and *Draksa* each separately taken with honey checks haemorrhage.
  2. Flowers of *Kovidara, Kasmarya* and *Salmali* are useful as vegetable in the disorder.

- ✓ **Anaemia**

  In the tepid decoction of *Danti* 40 gm *Kasmarya* (fruit) or *Draksa* 160gm is dipped and then pressed. The juice so extracted should be taken in anaemia.

- ✓ **Thirst**

  1. *Kasmaryadi panaka.*
  2. The liquid gruel of parched paddy mixed with honey, *Ghrta* mixed with jaggery and *Kasmarya* added with sugar should be taken to check thirst.

- ✓ ***Vatarakta***

  1. The paste of *Kasmarya*, *Madhuka* and *Saktu* is useful.

2. Oil cooked with *Guduchi* decoction and milk or *Draksa* decoction or the decoction of *Madhuka* and *Kasmarya* alleviates *Vatarakta*.

✓ ***Sitapitta* (urticaria)**

The ripe fruits of *Kasmarya* are dried and then cooked with cow- milk and taken with the same keeping on the wholesome diet. It destroys urticaria.

✓ **As *Rasayana***

Kasmarya- rasayana.

✓ **Atrophy of foetus and child**

In such condition, milk cooked with *Sarkara*, *Kasmarya* and *Madhuka* stimulates the growth.

✓ ***Angulivesta* (whitlow)**

Wrapping with seven tender leaves of *Kasmarya* destroys the disease.

✓ **Slackness of breast**

Sesamum oil cooked with decoction and paste of *Kasmarya* is applied with a cotton- swab on breast. It makes them developed and tight.

✓ ***Greying* of hairs**

1. Oil of *Bibhitaka, nimbi* and *Gambhari* separately taken as snuff checks the disease.
2. *Bibhitaka* oil cooked with decoction and paste of root, heart-wood, flower, fruit and leaves of *Kasmarya* and taken as snuff destroys the disease.
3. *Kasmarya taila*

✓ ***Stana Vardhana***

Oil prepared with *Gambhari patra* is used for external application.

✓ ***Raktapitta***

Flowers of *Kovidar, Kasmarya, & Salmali* are used as diet.

Part Used – Root, fruit, flower, leaves.

Dosage – Root bark decoction – 50-100 ml.

Fruit powder – 1-3 gm[44]

Preparation and Formulations[45]

Dasmularista, Sriparni taila, Draksadi kwath, Kasmaryadi panaka, Kasmarya rasayana, Kasmarya taila, Arvindasava, Shriparnyadi kvatha, Brihat panchamoolyadi kvatha, Mooshakayadi taila, Indukanta ghrita, Dhanvantara ghrita.

CONCLUSION

The present review indicates the importance of *Gmelina arborea* as one of the classical medicinal plants. It is one of the main ingredient of famous Ayurvedic preparations. It bears all the basic properties of a drug described by Acharya *Charaka* and has proved to be an important source of therapeutic agents for some trouble some diseases like- *Soth*, *Amasula*, *Arsa, Visa roga, Jvara*. The pharmacological activities proved are yet to be further evaluated and revalidated by clinical trials. Thus, the utility of *Gmelina arborea* as a medicinal plant has increased many folds over a period of time.

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