INTERNATIONAL
AYURVEDIC MEDICAL
JOURNAL

IAMJ

International Ayurvedic Medical Journal, (*ISSN: 2320 5091)* (July, 2017) 5(7)

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

Manasa K[1], Shrikanth P[2], Ravikrishna S[3], Suchithra Prabhu[4]

[1]PG Scholar, [2]HOD and Professor, [3]Assisstant Professor - Department of Dravyaguna;
[4]Research Officer Department of Pharmacognosy and Phytochemistry;
Sri Dharmastala Manjunatheshwara College of Ayurveda and Hospital, Udupi, Karnataka, India

Email: manasakaithal@gmail.com

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-microscopic, Physicochemical standards

INTRODUCTION

Gambhari (*Gmelina arborea* Roxb) *is* one among the ten drugs included under *Dashamoola* 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 chikitsa*[1] 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 *snigdha*[4] and, ac-

cording to *Kaiyadeva nighantu Sriparni Rasa* is *Madhura, tiktha, Kashaya, Guru guna, Ushna veerya* and it is having *karma Trashnahara, 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. Drupe 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 samples[7].

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 saffranine. 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-insolubleash, water- and alcohol-soluble extractive, loss on drying at 105^0C 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, Saponins, Terpenoids, Tannin etc.

Thin-layer chromatography

Sample preparation

Gmelina arborea leaf extract *i* (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* 3µl, 6µl, 9µl 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 105^0C till the spots appeared. The developed plates were visualized in the CAMAG visualizing chamber. Rf values were put manually.

OBSERVATION AND RESULTS

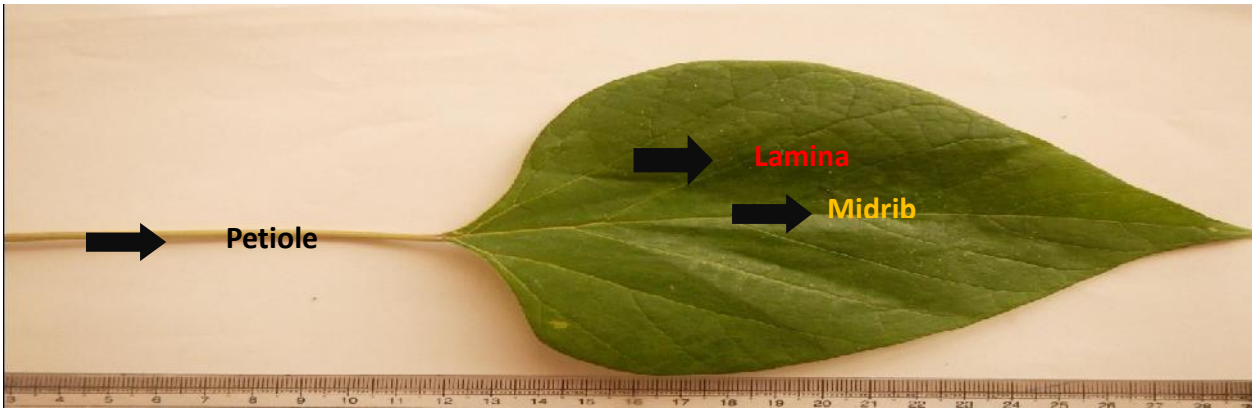
Organoleptic characters:

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 irritant smell.

Macroscopic characters

Leaves measures upto 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 upto 19cm in lenghth, cylindric/puberulous and glandular at the top.

Figure 1: Macroscopy of leaf of *Gmelia arborea*



Microscopic characters

Fig 2a. T.S of *Gmelina arborea*

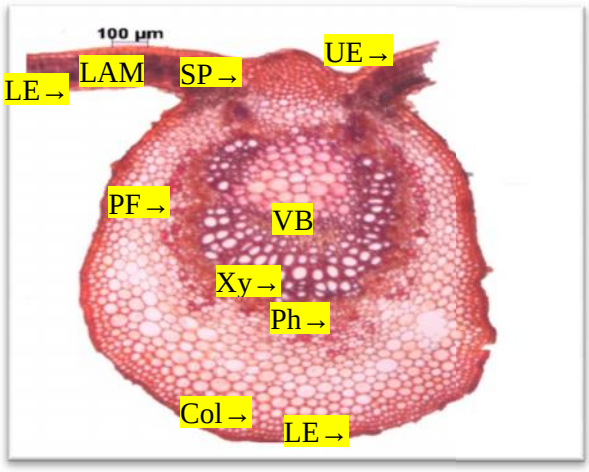


Fig 2b. Midrib enlarged

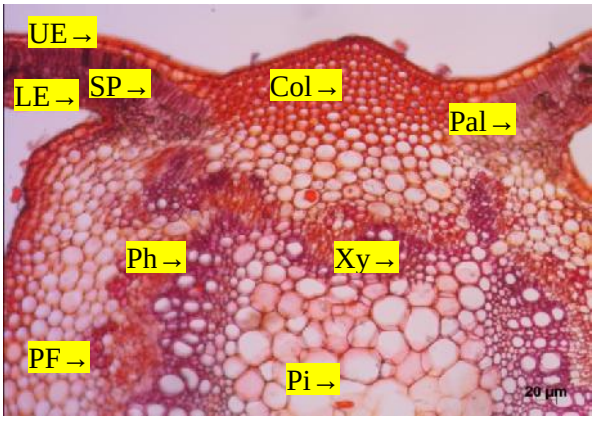


Fig 2c.Upper region of midrib enlarged

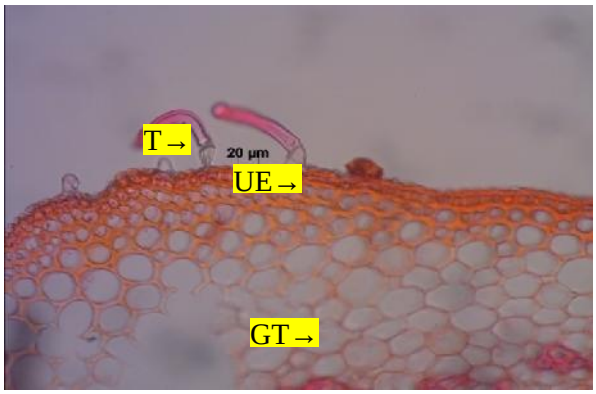


Fig 2d. Pith enlarged

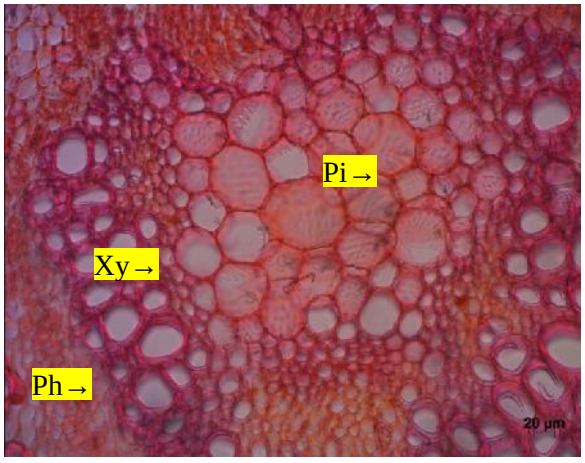


Fig 2e. T.S of Lamina

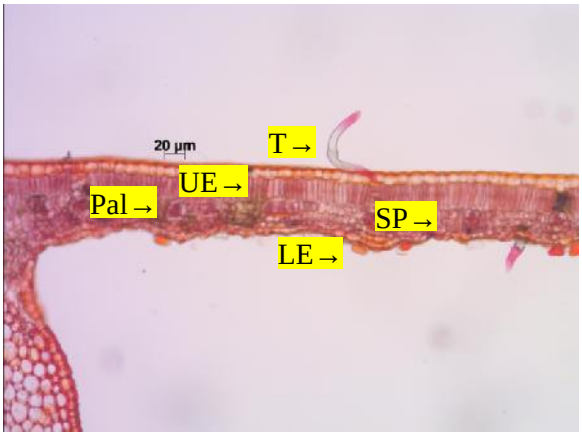
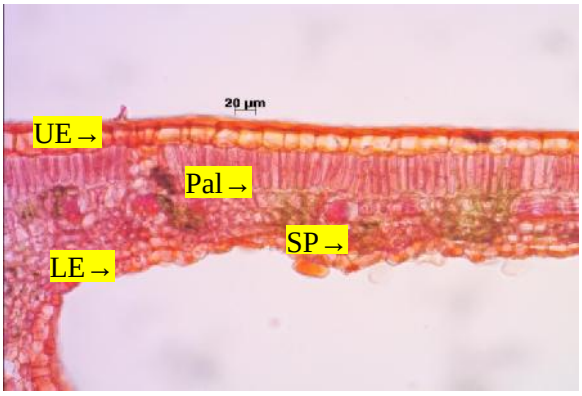


Fig 2f. Lamina enlarged



Lamina

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.

Figure 3: Powder microscopy of leaf of *Gmelia arborea*

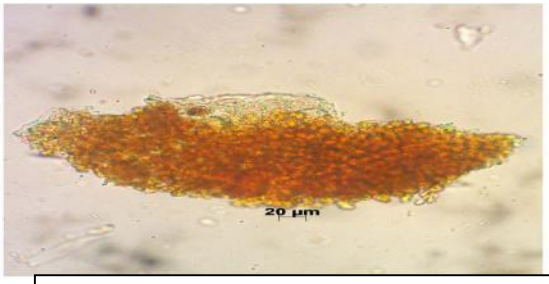


Fig. 3a. Mesophyll cells

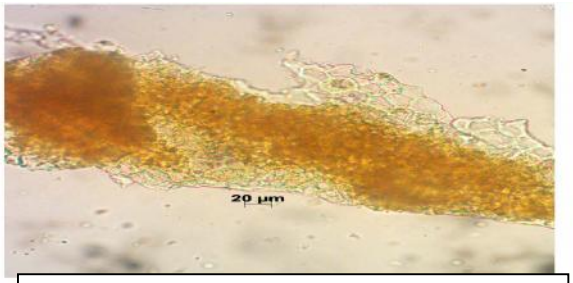


Fig. 3b. Epidermal cells in surface view

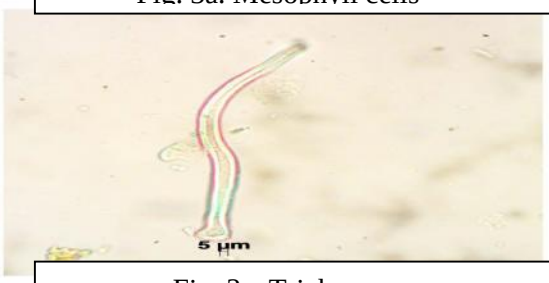


Fig. 3c. Trichome

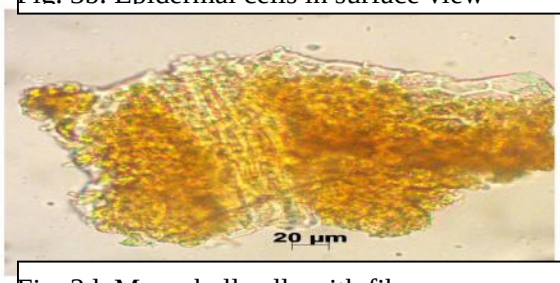


Fig. 3d. Mesophyll cells with fibres

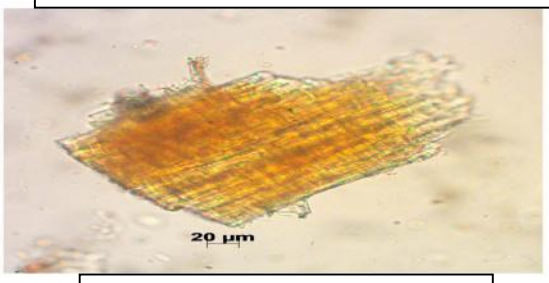


Fig. 3e. Bundle of fibres

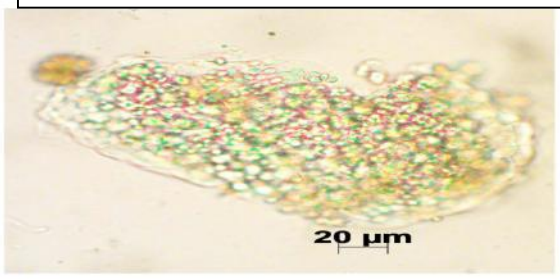


Fig. 3f. Starch grains

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%.

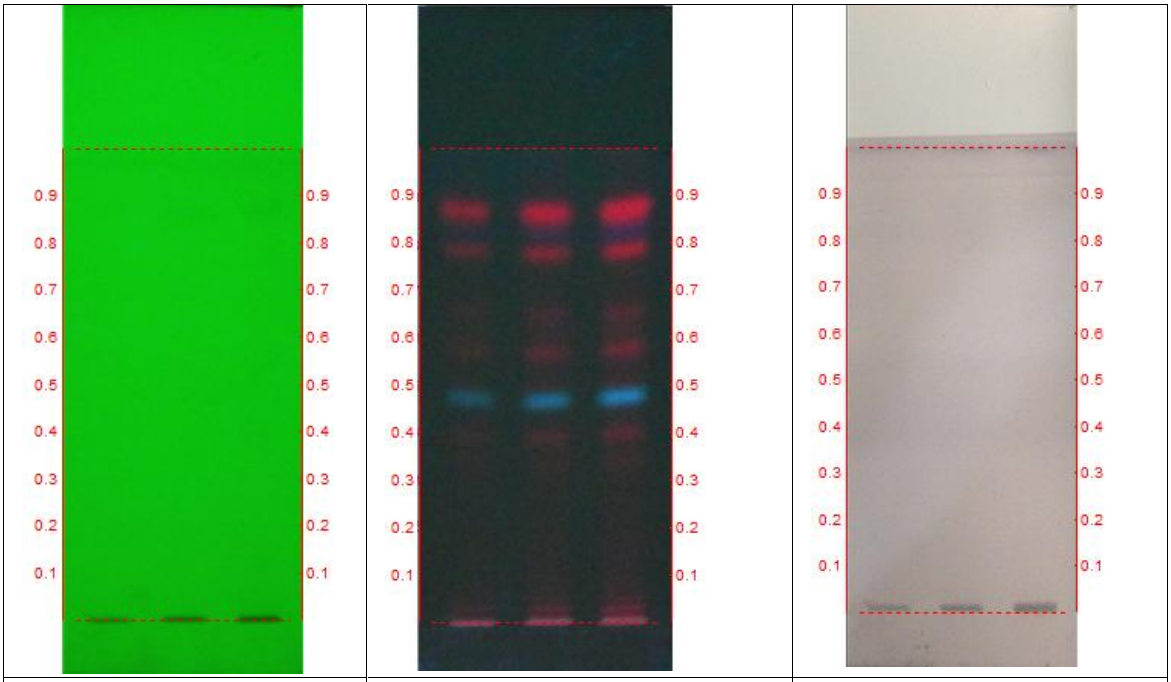
Phytochemical test

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



Short UV	Long UV	Post derivatisation

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

Ethno botanically, 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, analgesic some are used as muscle relaxants [10] *Gambhari* is having *tiktharasa* 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 choleststerol 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.

Moisture content in leaf of *Gambhari* was found to be 12.55%.Total ash value was 0.50 and Acid insoluble value 0.00.Extractive value was 1.14 and 11.03% of alcoholic and aqueous extract respectively.

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 swarasa* 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 *swarasa* is *Kashaya, Tikta* and *Madhura.* It is having *Ushna veerya* and *Katu vipaka*.

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. The results of the study can serve as a valuable source of pharmacognostic information as suitable standards for its identification.

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

And also can be taken as reference for future studies.

REFERENCES

1. Agnivesha, Caraka Samhita revised by Caraka and Dridabala, with Ayurveda Dipika commentary by Chakrapanidatta. Edited by Acarya Yadavji Trikamji. Varanasi: Choukhamba Oreintalia; ,2013, Pp. 738, pg.430.
2. Caraka Samhita revised by Caraka and Dridabala, with Ayurveda Dipika commentary by Chakrapanidatta. Edited by Acarya Yadavji Trikamji. Varanasi: Choukhamba Oreintalia; ,2011, Pp. 738, pg.488
3. Sushrutha, Sushrutha Samhita, with Nibandha Sangraha Commentary of Dalhanacharya, edited by Jadavaji Trikamji Acharya, Published by Chaukhambha Orientalia ,2010, Varanasi, Chikitsastana 1,Pp.824,Page no.406

4. Acharya Bhavamishra. Guduchyadivarga In: KC Chunekar commentator. Pandey GS editor. Bhavapraksaha Nighantu. Varanasi: Chaukhambha Bharati Academy; 2010. Pg- 264 to 266.pp960
5. Kaiyadeva. Oshadhivarga. In: Sharma Priyavrat, Sharma Guru Prasad editors. Pathyapathya Vibodhaka. Varanasi: Chaukhambha Orientalia; 1979 pg-9, pp-696
6. Bhat Gopalakrishna K. Flora of South Canara. Udupi: Bhat Gopalakrishna K; 2014,pg. no. 749, pp928
7. *www.apjtb.com/zz/2012s3/25.pdf*
8. Quality control methods for medicinal plant materials, WHO, Geneva 1998, 16-20, 25-80.
9. Dey P., Mukherjee M., Bhakta T., Ghosh T.K. Preliminary Phytochemical Studies of Leaf Extracts of *Molineria recurvata*. J. Chem. Pharm.Res 2012; 4, 7: 3727-30.
10. Ahmedzai S. New approaches to pain control in patients with cancer. Eur J Can. 1997;33(Suppl 6):S8–14. [PubMed]
11. Yokota T. The structure, biosynthesis and functions of brassinosteroids. Trends Plant Sci. 1997;2:137-143.
12. Bathori M., Toth N., Hunyadi A., Marki A., Zador E. (2008) Phytoecdysteroids and anabolic-androgenic steroids–structure and effects on humans. Curr. Med. Chem. 15, 75–91 [PubMed]
13. Grover JK, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. J Ethnopharmacol. 2004;93:123–32. [PubMed]
14. Farinola N, Piller N (2005) Pharmacogenomics: its role in re-establishing coumarin as treatment for lymphedema. Lymphat Res Biol 3: 81–86.

Source of Support: Nil
Conflict Of Interest: None Declared

How to cite this URL: Manasa K Et Al: Pharmacognostic And Phytochemical Study Of Leaf Of Gambhari (Gmelina Arborea Roxb). International Ayurvedic Medical Journal {online} 2017 {cited July, 2017} Available from: http://www.iamj.in/posts/images/upload/2343_2351.pdf